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Accession numbers cited in this Supplement fall within the following ranges.

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 197)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in August 1979 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*



Scientific and Technical Information Branch

1979

National Aeronautics and Space Administration

Washington, DC

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 193 reports, articles and other documents announced during August 1979 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964, since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology; toxicology; safety and survival; life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1979 Supplements.

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TYPICAL CITATION AND ABSTRACT FROM STAR

NASA SPONSORED DOCUMENT		AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER	N79-10741*	
TITLE	McDonnell-Douglas Astronautics Co Huntington Beach Calif	CORPORATE SOURCE
AUTHOR	GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G1894), PHASE 3 Final Report	
REPORT NUMBER	R E McEnulty Sep 1978 23 p refs (Contract NAS9-14877)	PUBLICATION DATE
COSATI CODE	(NASA-CR-151836 MDC-G7699) Avail NTIS HC A02/MF A01 CSCL 06K	CONTRACT OR GRANT
	The work performed during Phase 3 of the Generalized Environmental Control Life Support System (ECLSS) Computer Program is reported Phase 3 of this program covered the period from December 1977 to September 1978 The computerized simulation of the Shuttle Orbiter ECLSS was upgraded in the following areas (1) the payload loop of the Shuttle simulation was completely recoded and checked out (2) the Shuttle simulation water and freon loop initialization logic was simplified to permit easier program input for the user (3) the computerized simulation was modified to accept the WASP subroutine which is a subroutine to evaluate thermal properties of water and freon (4) the 1108 operating system was upgraded by LEC (5) the Shuttle simulation was modified to permit failure cases which simulate zero component flow values and (6) the Shuttle SEPS version was modified and secure files were setup on the 1108 and 1110 systems to permit simulation runs to be made from remote terminals	AVAILABILITY SOURCE
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TYPICAL CITATION AND ABSTRACT FROM /AA

NASA SPONSORED DOCUMENT		
AIAA ACCESSION NUMBER	A79-12869*	
AUTHOR'S AFFILIATION	Studies on the erythron and the ferrokinetic responses in beagles adapted to hypergravity D A Beckman, J W Evans (California, University, Davis Calif) and J Oyama (NASA, Ames Research Center Biomedical Research Div, Moffett Field, California, University, Davis Calif)	TITLE
PUBLICATION DATE	Aviation, Space, and Environmental Medicine, vol 49, Nov 1978, p 1331 1336 23 refs Grant No NCA2 OR180 505	AUTHORS
	Red cell survival ferrokinetics, and hematologic parameters were investigated in beagle dogs exposed to chronic hypergravity (2.6 Gx) Ineffective erythropoiesis, red cell mass, plasma volume, and Cr 51-elution were significantly increased, maximum Fe 59 incorporation was decreased, and there was no change in the mean erythrocyte life span following autologous injection of Cr 51 labeled red cells and Fe 59 labeled transferrin Red cell count F(cells), total body hemoglobin (Hb) susceptibility to osmotic lysis, and differential reticulocyte count were increased White blood cell count, venous blood %Hb, mean cell volume, mean cell Hb mean cell Hb concentration, and serum iron were decreased No changes were observed for body mass, mg Fe per g Hb, iron binding capacity, percent saturation of iron carrying capacity, or the electrophoretic mobility of purified Hb This study indicated that chronic exposure to hypergravity induced changes in red cell size volume total mass and membrane permeability (Author)	TITLE OF PERIODICAL
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 197)

SEPTEMBER 1979

IAA ENTRIES

A79-35942 # Some properties of conservative systems (O nekotorykh svoystvakh konservativnykh sistem) E M Rubanovich (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *Moskovskii Universitet, Vestnik, Seriya I - Matematika, Mekhanika*, Mar-Apr 1979, p 83-87. In Russian

For a nonlinear model of a walking robot, Formal'skii (1978) has formulated a boundary value problem of determining the motion that satisfies some specific boundary conditions, and has obtained some symmetry properties for the set of solutions for a conservative system. These properties provide insight into the structure of solutions and their qualitative aspects and make it possible to decrease the computational labor. In the present paper, it is shown that these results apply also to a wide class of conservative systems with stationary holonomic constraints. V P

A79-36041 A review of recent concepts of the problem of the origin of life. L M Mukhin (Academy of Sciences, Intercosmos Council, Moscow, USSR) *Acta Astronautica*, vol 6, Jan-Feb 1979, p 59-65. 26 refs

Concepts of the origin of life on earth are reviewed, considering the constraints imposed by the primitive earth environment and factors of biological evolution. Calculations of solar ultraviolet flux to the primitive earth indicate that the possible amount of precursor organic monomers formed in the earth's atmosphere would be insufficient to account for the evolution of life, assuming they formed under equilibrium conditions. Therefore, it is concluded that organic monomers must have been synthesized under nonequilibrium conditions, possibly in volcanic regions. The evolution of the genetic code has remained difficult to explain, and it is suggested that the replicative function of polynucleotides must have arisen after the appearance of protocells. The directed panspermia model, in which life was brought to earth by the activity of extraterrestrial civilizations after evolving on a planet with more suitable conditions, has been proposed to resolve many difficulties. A L W

A79-36046 Physical performance and peak aerobic power at different body temperatures. U Bergh and B Ekblom (Karolinska Institutet, Stockholm, Sweden) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 46, May 1979, p 885-889. 20 refs

A79-36047 Glucose metabolism in rat lung during exposure to hyperbaric O₂. D J P Bassett and A B Fisher (Pennsylvania, University, Philadelphia, Pa.) *Journal of Applied Physiology Respiratory, Environmental and Exercise Physiology*, vol 46, May 1979, p 943-949. 26 refs. Grants No NIH HL 15061, No NIH-HL 15013

A79-36048 Circulatory response to arterial hyperoxia. Y Cassuto and L E Farhi (New York, State University, Buffalo, N Y) *Journal of Applied Physiology Respiratory, Environmental and*

Exercise Physiology, vol 46, May 1979, p 973-977. 15 refs. Contract No N00014-68-A-0216

Experiments were conducted on unanesthetized white rabbits (2.5-3.5 kg) in which catheters were inserted into the right ventricle through a jugular vein and into a carotid artery. One group of animals served as controls, while the other was infused with a fluorocarbon emulsion. The objective was to assess the circulatory response to 100% O₂ at 1 and 3 atm. The results suggest that factors other than Pa(O₂) are important in the peripheral response to arterial hyperoxia, and that regardless of where the sensors are located, be it in the capillary or in the tissues, the decrease in perfusion necessarily entails the existence of hypoxic areas. The importance of this phenomenon in experimental or therapeutic exposure to elevated O₂ levels merits further exploration. S D

A79-36097 # Characteristics of EEG changes in rabbits in response to local cooling or heating of the central thermosensory area (Osobennosti izmeneni EEG u krolikov, vyzvaemykh lokal'nym okhlazhdeniem ili nagrevaniem tsentral'noi termosensornoj oblasti) I K Iaichnikov (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Feb 1979, p 224-229. 18 refs. In Russian

A79-36098 # Self-regulation of cerebral circulation under orthostatic influences (Autoregulatsiia mozgovogo krovoobrashcheniia pri ortostaticheskikh vozdeistviakh) M D Gaevvi, V G Mal'tsev, and V E Pogorelyi (Piatigorskii Farmatsevticheskii Institut, Pyatigorsk, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Feb 1979, p 263-268. 15 refs. In Russian

Acute experiments are conducted on locally anesthetized rabbits and cats (plus muscle relaxants) to investigate the self regulation of cerebral circulation (SRCC). Cerebral hemodynamics is evaluated in terms of changes in the perfusion pressure (PP) in the carotid arteries, cerebral blood flow, the pressure of the cerebral venous system, and the cerebrovascular resistance. In most experiments, SRCC is found to correlate with changes in PP under orthostatic influences. Different variants of SRCC and its possible mechanisms are discussed. S D

A79-36227 # A preliminary study of the air traffic controller's 'picture'. D Whitfield (Aston, University, Birmingham, England) *CATCA Journal*, vol 11, Spring 1979, p 19-22. 25, 28. 7 refs. Ministry of Defence Contract No AT/2097/024

An attempt is made to define and analyze the air traffic controller's 'picture' discussing advanced ATC systems, the upper limits on the size and complexity of the picture, and the nature of the picture. Consideration is given to such aspects as the meaning of the picture, the picture and controller workload, skill, general understanding of the situation, predictive aspects of the picture, memory and the picture, and techniques of investigating the picture. The main conclusion is that it is difficult to separate the picture from general descriptions of air traffic controller's skills. Areas for further research in this field are suggested. A T

A79-36365 Dynamics of an image viewed through a rotating mirror. J E Goodson (U S Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.) *Optical Society of America, Journal*, vol 69, May 1979, p 771-775. Navy-supported research

It is frequently assumed that the virtual image of a target viewed through a rotating mirror moves with respect to the observer at twice the angular rate of mirror rotation. This assumption is false, and leads to imprecise treatment of open-loop tracking systems. Of particular interest is a class of dynamic visual acuity experiments in which acuity targets are viewed through a rotating mirror, where control of image velocity, exposure time, and image dimensions are of critical importance. Expressions are derived which describe the direction of the target image with respect to the observer as a function of mirror position. This relationship is nonlinear, and depends upon the distances from the center of rotation of the mirror (A) to the observer (C), and to the target (B), and upon the included angle BAC. Expressions are further derived for image velocity, acceleration, mirror intercept, and image dimensions as functions of mirror position. (Author)

A79-36385 # Pathophysiology of overloads Bibliography of Soviet publications (Patofiziologiya peregruzok Bibliograficheskii ukazatel' otechestvennoi literatury) A A Sergeev Leningrad, Izdatel'stvo Nauka, 1978 80 p 1191 refs In Russian

The problem of overloads (stressful accelerations) has become a vital concern of general biology, intimately related to all kinds of transportation. An almost complete bibliography is presented of Soviet publications pertaining to the effects of overstress on living organisms, mostly humans. Attention is given to morphological, physiological, biochemical, and radiologic studies, transverse and impact overloads, Coriolis accelerations, overstresses and height acclimation, overstresses and inhalation of gas mixtures, overload and vibration, overload and hypokinesia, overload and hypoxia, overload and hypothermia, overload and magnetic field, overload and weightlessness, overstress and radiation, overstress and nutrition, enhancement of overstress resistance, and artificial gravity. S D

A79-36575 Cardiac changes during behavioral stress in dogs R A Galosy, L K Clarke, and J H Mitchell (Texas, University, Dallas, Tex.) *American Journal of Physiology*, vol 236, May 1979, p H750-H758 23 refs Grant No NIH-HL-19257

Experiments were conducted on eight dogs of both sexes (14-20 kg) to investigate daily cardiac adaptation to a Sidman shock avoidance procedure, to assess, without the use of pharmacologic blocking agents, the role of cardiac beta-adrenergic activity as determined by the maximal rate of left ventricular pressure development, and to compare the cardiac changes in stressed and nonstressed animals over a 13-day period. It is shown that controlled behavioral stress produces increased cardiac performance as evidenced by elevations in heart rate, maximal rate of left ventricular pressure development, and left ventricular systolic pressure, without substantial alterations in overt bodily activity. An indirect assessment of the neural mechanisms responsible for the observed cardiovascular changes suggests that the autonomic nervous system is capable of considerable plasticity of function, and that neural control of cardiovascular function may be dependent on the environmental stimuli impinging upon the organism at any given point in time. S D

A79-36576 * A tethering system for direct measurement of cardiovascular function in the caged baboon L D Byrd (Emory University, Atlanta, Ga.) *American Journal of Physiology*, vol 236, May 1979, p H775-H779 11 refs NASA-supported research, Grants No PHS-DA-01161, No PHS-MH-07658, No NIH-RR-00165, No NIH-RR-00168

A device suitable for the continuous measurement of physiological activity in large, conscious monkeys has permitted the direct recording of systemic arterial blood pressure and heart rate in caged baboons. The device comprises a lightweight fiberglass backpack, retained in place on the baboon by a thoracic elastic band and shoulder straps, and a flexible stainless steel tether connecting the pack to an electroannular slip-ring in the top center of the baboon's cage. A chronically indwelling arterial catheter inserted retrograde

into the abdominal aorta via the internal iliac artery and connected to a small pressure transducer on the pack provides direct measurement of blood pressure and heart rate. Body fluids can be sampled or drugs administered via an indwelling catheter in the inferior vena cava. Electrical and fluid connections between the fiberglass pack and recording and infusion equipment located outside the cage pass through the flexible tether and remain protected from the subject. The reliability of the tethering system has been demonstrated in physiological, pharmacological, and behavioral experiments with baboons. (Author)

A79-36628 Health and safety hazards associated with solar concentration systems L L Young, III (Sandia Laboratories, Albuquerque, N Mex.) *Solar Energy*, vol 22, no 4, 1979, p 329-333 8 refs

Health hazards associated with solar concentration systems are reviewed with particular emphasis placed on hazards to the eye. A methodology for computing eye hazards associated with solar collector and receiver systems is developed, threshold values are derived and multiple beam exposure parameters. B J

A79-36869 A sample volume tracking unit for pulsed Doppler echocardiography J G Davis, D Greene (Lovelace Medical Foundation, Albuquerque, N Mex.), K L Richards (New Mexico, University, U S Veterans Administration Hospital, Albuquerque, N Mex.) *IEEE Transactions on Biomedical Engineering*, vol BME-26, May 1979, p 285-288 11 refs

An inexpensive sample volume (SV) tracking unit has been developed for use in pulsed Doppler echocardiography. The tracking unit allows the SV depth to be modulated by any desired time-varying function. Consequently, artifacts created by wall and leaflet motion are minimized in the Doppler audio signal. (Author)

A79-37130 # Effects of partial sleep deprivation on psychological performance and behaviour V Kumar, P C Chatterjee, N Ramachandran, J K Gupta (Indian Air Force, Institute of Aviation Medicine, Bangalore, India), and K R Banerjee (Air Force Central Medical Establishment, New Delhi, India) *Aviation Medicine*, vol 22, Dec 1978, p 1-7 14 refs

Ten healthy male volunteers (21-29 yr) were deprived of sleep during the second half of the night so that maximum REM sleep deprivation could be produced. The subjects were allowed only 4-hr sleep (10 p.m. to 2 a.m.) every night for three consecutive nights and days. The effects of this partial sleep deprivation on task performance and behavior were studied. The task performance was assessed on the following tests: critical fusion frequency, stability of attention test, flight-oriented psychomotor test, choice reaction time test, spatial orientation test, and pursuit rotor test. The results indicated an increase in deterioration in performance on certain tests with further partial sleep deprivation on two successive nights. The deterioration in performance on sudden awakening was significant. The testees developed subjective complaints such as increased desire to sleep, lack of concentration, increased appetite, etc. These subjective complaints disappeared with one night recovery sleep and 2-3 hours of sleep next afternoon. S D

A79-37131 # Aerobiotelemetry from a fighter aircraft M M Singh, B R S Reddy (Indian Air Force, Institute of Aviation Medicine, Bangalore, India), S Krishnamurti, and S P Verma *Aviation Medicine*, vol 22, Dec 1978, p 8 14 20 refs

An air-to-ground telemetric system for recording ECG of pilots from fighter aircraft is developed and used successfully to obtain ECGs from eight normal airborne subjects and eight subjects with 'nonspecific' ECG abnormalities. The crew performed a set flight maneuver pattern in all cases while ECG was being recorded in the ground laboratory. The observed changes in ECG during flight are tabulated. It is concluded that the ECG changes reflect only transient physiological changes and vanish as soon as the +Gz maneuver is stopped. S D

A79-37132 # Positive pressure breathing as a protective technique in +Gz acceleration S C Marwaha (Indian Air Force, New Delhi, India) *Aviation Medicine*, vol 22, Dec 1978, p 15-20 8 refs

Twelve experienced air-crew subjects were exposed to +Gz acceleration to assess the protection afforded by 30 mm of Hg positive pressure breathing (PPB) and anti-g suit PPB in combination with anti-g suit provided a consistent and significant protection over relaxed tolerance (mean increase in tolerance 2.64 ± 0.34) No serious ECG abnormalities were seen (Author)

A79-37133 # Incidence of spinal disability amongst IAF pilots - Follow up of 38 cases A Roychoudhury (Armed Forces Medical College, Poona, India) and R R Kapur (Indian Air Force, Command Hospital, Bangalore, India) *Aviation Medicine*, vol 22, Dec 1978, p 21-24 6 refs

Thirty eight cases of spinal disability evaluated at IAM Bangalore have been presented These include 26 cases of spinal fractures suffered due to ejections, crash landings, ejection testing trials and road accidents Eleven cases were detected during routine medical examination The pattern of vertebral fractures suffered due to various causes has been analyzed The disposal of these cases for fitness for flying duties has been discussed giving reasons for such disposal (Author)

A79-37134 # Vertebral fractures in Gnat ejections P C Sharda (Indian Air Force, Medical Directorate, New Delhi, India) *Aviation Medicine*, vol 22, Dec 1978, p 25-28

Vertebral fractures constitute the most serious medical problem associated with a successful ejection Cervical vertebral fracture is of particular importance as it causes a pilot to be permanently unfit for ejection seat aircraft Three cases of cervical vertebral fractures after ejection from Gnat aircraft are reported The causative factor has been head-neck flexion during ejection Problems of postural inadequacies in Gnat aircraft have been discussed and recommendations made (Author)

A79-37135 # Analysis of climatic data and cockpit thermal conditions at a fighter base in North West India G Singh (Indian Air Force, New Delhi, India) *Aviation Medicine*, vol 22, Dec 1978, p 29-33

In the first stage of the study temperature humidity index was analysed at a fighter base in North West India for one year, and periods of high thermal stress were identified In the second stage, serial cockpit air temperatures before taxiing out and takeoff were recorded, and total sweat loss in actual operational sorties was in winters and summers This gave mean values of $25.5 \text{ C}/28.7 \text{ C}$ cockpit air temperature with 123 gm total sweat loss in winter and $37.8 \text{ C}/41.4 \text{ C}$ cockpit air temperature with 796 gm total sweat loss in summer (Author)

A79-37136 # Correlation of binocular vision test results with synaptophore evaluation S K Goel (Air Force Central Medical Establishment, New Delhi, India) *Aviation Medicine*, vol 22, Dec 1978, p 39-41

Three hundred and seventy five cases in the age group 17 to 30 years were examined for their binocular vision and convergence by the Bishop Harman Diaphragm Test and Maddox Rod Test These findings were compared with those obtained from synaptophore The results correlated well for the objective convergence and higher degrees of convergence insufficiency However, the same did not hold good for the borderline values of subjective convergence and Maddox Rod Test carried out at 33 cms (Author)

A79-37137 # Influence of Beta-Blockade on asymptomatic ST-T wave changes - A follow up study S K Dham and S Krishnamurti *Aviation Medicine*, vol 22, Dec 1978, p 42-45 15 refs

Electrocardiograms of 30 cases of T wave abnormalities among apparently healthy subjects in the age group 21-54 years were studied before and after administration of Beta Blockers (Propranolol 40 mgm) These cases were followed up for 3 years The study shows that propranolol has a limited value in distinguishing between ECG changes of ischaemia and other causes It has a definite role in cases showing evidence of beta adrenergic stimulation with cardiac reactivity (Author)

A79-37138 # Some electrophysiological concepts of the U wave of ECG N M Murali *Aviation Medicine*, vol 22, Dec 1978, p 46, 47 5 refs

The normal ECG complexes have been correlated with the sequence of electrical events in the heart P wave is the result of atrial muscle depolarization, the QRS complex is produced by the depolarization of the ventricular myocardium and the T wave results from the return of ventricular muscle to the resting state due to repolarization At times the T wave is followed by a small wave called the U wave, low in amplitude and not always recorded It is best observed in the precordial leads The electrophysiology of the U wave is not yet properly understood (Author)

A79-37139 # Aeromedical aspects of flying training with special reference to instructor pupil relationship. B A Coelho (Air Force Academy, Hyderabad, India) *Aviation Medicine*, vol 22, Dec 1978, p 48-51

Student pilots quite often experience air sickness, fear of flying, and fear of heights How easily and quickly a student pilot overcomes the physiological and psychological problems during flight training depends largely on the instructor-pupil relationship The instructor not only imparts knowledge and skills but also shapes the student's entire personality as a pilot The discussion covers affection, flight discipline and airmanship, stress and emotional stability, firmness and objective views, the student as an individual, handling of the student, and difficulties in establishing a dependable instructor-student relationship Also discussed are the role of psychologists and aviation medicine specialists, a 'know each other' program, and recommendations and suggestions to achieve a greater sense of harmony, relaxation and understanding SD

A79-37705 Aircrew helmet protection against potential cerebral concussion in low-magnitude impacts R W Norman, P J Bishop, M R Pierrynowski, and J C Pezzack (Waterloo, University, Waterloo, Ontario, Canada) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 553-561 23 refs Department of Supply and Services Contract No 25U76-00263

The response of the Gentex DH-151 (contact type) and Gentex 411 (suspension type) aircrew helmets to low-magnitude impacts, such as those sometimes encountered during cockpit buffeting, in ejection, and in parachute landings, was studied to augment the data base on helmet performance The helmets, mounted on a Hodgson headform, were dropped on the crown and rear at impact velocities up to 4.97 m/s Acceleration time histories were tape recorded and digitized and Gadd Severity Indices (GSI), among others, were calculated from the resultant acceleration curve Both helmets kept the GSI below predicted concussion thresholds at 4.97 m/s and were considered to perform well on initial impacts On second impacts, the GSI rose considerably because the shell and liner of the DH-151 cracked and the suspension of the '411' stretched during the first blow Improvement of the multiple impact performance of both helmets appears desirable, although the suspension helmet performed slightly better than the contact helmet with respect to the criterion used (Author)

A79-37706 Skin temperature changes in paradoxical sleep in man in the cold A G C Buguet, S D Livingstone, and L D Reed (Service de Santé des Armées, Centre de Recherches, Lyons, France, Civil Institute of Environmental Medicine, Downsview, Ontario, Canada) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 567-570 27 refs

A79-37707 Doppler detection of thresholds for decompression-induced venous gas emboli in the awake rat D G Watt and Y C Lin (Hawaii, University, Honolulu, Hawaii) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 571-574 20 refs Grant No NOAA 04-7-158-44129

A79-37708 Effect of induced cyclic changes of deep body temperature on task performances J R Allan, T M Gibson, and R G Green (RAF, Institute of Aviation Medicine, Farnborough, Hants, England) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 585-589 9 refs

Performance of three tests was studied during induced cycles of deep body temperature between limits of 37.8°C and 38.9°C. During heating phases skin temperature was 38.8°C and during cooling it was 36.1°C. A verbal transformation test, performed at the midpoint of each temperature cycle, showed no significant effect from the large differences in skin temperature and subjective comfort between heating and cooling. The test was considered to be insufficiently difficult. A pursuit rotor test and a colour/word interference test, performed at the end of the heating and cooling phases, showed mean decrements in performance of 15% and 4%, respectively. These results are related to the measured levels of deep body and skin temperature and to subjective assessments of comfort. (Author)

A79-37709 Regional heat loss in resting man during immersion in 25.2°C water C E Wade, S Dacanay, and R M Smith (Hawaii, University, Honolulu, Hawaii) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 590-593 16 refs Grants No NIH-RR-018-2-03, No NOAA-04-6-158-44114

A79-37710 Physiologic and performance measurements in simulated airborne combined stress environments J S Bowman and H J von Beckh (US Naval Material Command, Naval Air Development Center, Warminster, Pa.) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 604-608 15 refs Navy-supported research

The Naval Air Development Center's Human Centrifuge was used to assess the effects of repeated exposures to a simulated Air Combat Maneuvering (ACM) environment on various measures of physiological function and psychomotor performance. The environment consisted of a realistic ACM profile that included associated noise, high speed/stall buffet conditions, and increased intra-cockpit temperatures. The effects of varying the subject's seatback angle, as a function of the environment, was also measured. Analysis of the various physiological and performance data revealed the following: (1) heart rate was negatively correlated with tracking accuracy under the combined stress conditions of this study, (2) test conditions that included acceleration and buffet resulted in a significant decrement in tracking accuracy, (3) the addition of increased intra-cockpit temperatures, when combined with acceleration and/or buffet, produced a significant decrease in tracking accuracy, (4) increasing the seat-back angle from the vertical partially ameliorated the effects of the other stressors. Details of these findings, as well as results of various biochemical analyses, are discussed. (Author)

A79-37711 * Motion sickness in cats - A symptom rating scale used in laboratory and flight tests K B Suri, N G Dauntton (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.), G H Crampton (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif., Wright State University, Dayton, Ohio) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 614-618 24 refs

The cat is proposed as a model for the study of motion and space sickness. Development of a scale for rating the motion sickness severity in the cat is described. The scale is used to evaluate an anti-motion sickness drug, d-amphetamine plus scopolamine, and to determine whether it is possible to predict sickness susceptibility during parabolic flight, including zero-G maneuvers, from scores obtained during ground based trials. (Author)

A79-37712 Psychiatric education in aerospace medicine R J Ursano (USAF, School of Aerospace Medicine, Brooks AFB, Tex.) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 619-624 16 refs

The paper describes a portion of data collected in a study undertaken to assess the educational needs of a population consisting of physicians who differed in their training and experience in aerospace medicine. Three groups of physicians are surveyed: experienced flight surgeons, student flight surgeons, and psychiatrists trained in aerospace medicine. Adequate questionnaires are completed by the survey subjects. Analysis of the data provides information useful in the design of psychiatric curriculum for aerospace medicine education. S D

A79-37713 Frequency analysis of heart rate variability under flight conditions C Sekiguchi (Jikei University School of Medicine, Tokyo, Japan), Y Handa, M Gotoh, Y Kurihara, Y Nagasawa, and I Kuroda (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 625-634 19 refs

The factors causing heart rate variability (HRV) were investigated under various kinds of workloads and flight conditions. Frequency analysis of heart rate, and cross-correlation analysis with blood pressure and respiration, were performed by using the fast Fourier analyzer. Consequently, the main frequency of HRV at rest consisted of 0.1 Hz and 0.25-0.3 Hz. These fluctuations disappeared under physical loads, but the value of 0.1 Hz at first increased under moderate mental load and thereafter decreased as the mental load increased. It was suggested that the behavior of the frequency 0.1 Hz under mental load was influenced partly by higher brain centers. For the actual flight, the frequency decreased under takeoff and landing, and remained as at rest during the gunnery and acrobatic training flight. It was concluded that the evaluation of workloads under flight conditions by using the analysis of the factors of HRV was very useful to improve a man-machine interface. (Author)

A79-37714 Concurrent loss of consciousness and sino-atrial block during +Gz stress J E Whinnery, M H Laughlin, and J R Hickman, Jr (USAF, School of Aerospace Medicine, Brooks AFB, Tex.) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 635-638 24 refs

The paper reports an episode of sino-atrial block coincident with a complete loss of consciousness in a 33-year-old Caucasian male senior fighter pilot during a relaxed rapid-onset centrifuge acceleration exposure to 3.4 +Gz. Factors that could predispose other pilots to similar occurrences during the +Gz stress experienced while flying high-performance aircraft in aerial combat are discussed. Sino-atrial block is recognized on the EKG by absence of the entire P-QRS-T sequence. S D

A79-37715 Fighter index of thermal stress /FITS/ - guidance for hot-weather aircraft operations S A Nunneley and R F Stribley (USAF, School of Aerospace Medicine, Brooks AFB, Tex.) *Aviation, Space, and Environmental Medicine*, vol 50, June 1979, p 639-642 12 refs

Operation of fighter and trainer aircraft at low altitude in hot weather often involves significant heat stress on aircrews. Guidance for control of this stress and its adverse consequences has not heretofore been available. The Fighter Index of Thermal Stress (FITS) was derived from the Wet Bulb Globe Temperature (WBGT) using recent in-flight data on cockpit environments and assuming a fixed contribution from solar heating. The FITS table is entered with ground dry bulb temperature and dewpoint temperature, and yields an estimate of cockpit thermal stress. Caution and Danger Zones are designated on the table, based upon typical aircrew clothing, metabolic rate, and physiological status. Appropriate protective measures are recommended, including awareness of heat stress, limitations on ground operations, allowance of adequate recovery intervals, provision for fluid intake, and cancellation of flights under severe conditions. Possible applications of FITS are discussed.

together with its potential impact on flight operations at 30 USAF bases (Author)

A79-37919 **Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977** Edited by H Noda (Tokyo, University, Tokyo, Japan) Tokyo, Center for Academic Publications Japan, 1978 647 p \$55

Papers deal with various aspects of the origins of life, including the material and planetological environment for the origin of life, the prebiotic synthesis of small biological molecules and biological macromolecules, the origin of optical activity, the development of prebiotic organization, biochemical evolution, early biological evolution and certain theoretical aspects of the origin of life. Topics considered include the evolution of planetary atmospheres, results of the Viking Mars mission, the abiotic synthesis of amino acids, pyrimidines, oligonucleotides and polypeptides, the effects of the weak interaction on the origin of optical activity, coacervate and clay adsorption models of early cellular organization, the evolution of energy and osmoregulatory metabolisms, the development of proteins, nucleic acids and the genetic code and the probabilities of the evolution of life on the earth and other planets. A L W

A79-37928 **Prebiotic molecular evolution** C Ponnampereuma (Maryland, University, College Park, Md.) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977* Tokyo, Center for Academic Publications Japan, 1978, p. 67-81 23 refs

The history of carbon compounds from the birth of the universe to the appearance of life on earth is outlined. An examination of the abundances of elements in the sun, which is thought to reflect the composition of the universe, shows that the most abundant elements are those that life needs most. Organic building blocks have been detected in the interstellar medium, in meteorites and on the planet Jupiter and it has been shown that organic compounds could have formed in the primordial nebula and on the primitive earth. Starting with these monomers, the formation of organic polymers could have been effected by dehydration condensations in aqueous solutions coupled to the hydrolysis of certain condensing agents. Compounds proposed as condensing agents for the formation of peptide bonds include cyanamide, carbodiimide, dicyanamide, dicyandiamide, hydrogen cyanide tetramer, linear and cyclic polyphosphates and amino acyl adenylates. The spread of life on earth only after the Cambrian period is considered to be due to the previous unavailability of phosphorus, a necessary template and condensing agent for the evolution of functional biopolymers. A L W

A79-37930 **Synthesis of amino acids under primitive earth conditions in the presence of clay** A Shimoyama, N Blair, and C Ponnampereuma (Maryland, University, College Park, Md.) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977* Tokyo, Center for Academic Publications Japan, 1978, p. 95-99 10 refs

Methane nitrogen atmospheres were subjected to low-energy (117 V and 0.12 A) or high energy (117 V and 0.16 A) electric discharges in the presence or absence of Na montmorillonite. Net discharge time was 12 hr. Eleven amino acids (glycine, alanine, valine, serine, glutamic acid, sarcosine, alpha-amino-n-butyric acid, norvaline, beta-alanine, alpha, beta-diaminopropionic acid, and alpha, gamma-diaminobutyric acid) were identified in the reaction mixture. Highest yield (0.2% conversion of the initial nitrogen gas) was obtained in the high-energy discharge experiment in the presence of clay. The formation of larger molecules of amino acids appears to be favored by the presence of clay, although the reaction pathway to the different amino acids is probably unchanged. It is suggested that the presence of clays in the prebiotic earth environment may have aided abiotic synthesis. C K D

A79-37932 * **Prebiotic condensation reactions using cyanamide** E Sherwood, D W Noonan, J Eichberg, D E Epps, and J Oro (Houston, University, Houston, Tex.) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977* Tokyo, Center for Academic Publications Japan, 1978, p. 105-111 28 refs. Grants No. NIH-NS-12493, No. NGR 44-005-002, No. NCA2 OP295 0591

Condensation reactions in cyanamide, 4-amino-5-imidazole-carboxamide and cyanamide, imidazole systems under dehydrating conditions at moderate temperatures (60 to 100 deg C) were investigated. The cyanamide, imidazole system was used for synthesis of palmitoylglycerols from ammonium palmitate and glycerol. With the addition of deoxythymidine to the former system, P1, P2-dideoxythymidine 5 prime-phosphate was obtained, the same cyanamide, 4-amino-5-imidazole-carboxamide system was used to synthesize deoxythymidine oligonucleotides using deoxythymidine 5 prime-phosphate and deoxythymidine 5 prime-triphosphate, and peptides using glycine, phenylalanine or isoleucine with adenosine 5 prime-triphosphate. The pH requirements for these reactions make their prebiotic significance questionable, however, it is conceivable that they could occur in stable pockets of low interlayer acidity in a clay such as montmorillonite. C K D

A79-37935 **Experimental approach to the chemical evolution in the primeval sea I - Formation of amino acids and amino acid polymers in modified sea mediums** T Ochiai, H Hatanaka, M Ventilla, H Yanagawa, Y Ogawa, and F Egami (Mitsubishi-Kasei Institute of Life Sciences Tokyo, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977* Tokyo, Center for Academic Publications Japan, 1978, p. 135-139 5 refs

The reaction of formaldehyde and hydroxylamine in a modified sea medium characterized by higher concentrations of minor transition elements, lower pH (pH 5.5) and lower NaCl concentration than normal sea water was investigated. A variety of organic compounds were obtained, including alanine, alpha-aminobutyric acid, glycine, serine, aspartic acid, and threonine. The formation of compounds with molecular weight of up to 1000 was confirmed by gel filtration of the products. Glycerine was formed under special conditions. The concentration of molybdate was found to have a marked effect on the type of amino acid obtained. C K D

A79-37937 **Prebiotic synthesis of amino acids by carboxylation of amines in oxidative atmosphere** M Inoue, S Sano, and S Enomoto (Toyama Medical and Pharmaceutical University, Toyama, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977* Tokyo, Center for Academic Publications Japan, 1978, p. 153-157 6 refs

The synthesis of amino acids by carboxylation of alkylamines was carried out under oxidative atmospheres containing oxygen or nitromethane. A full range of alpha-amino acids was obtained from reaction systems containing alkylamines, CO₂, NH₃ and H₂O at 130 to 180 C. An excess of ammonia was found to be indispensable to carboxylation, in the absence of ammonia N-methyl amino acids were obtained selectively. It is suggested that the synthesis of amino acids on the prebiotic earth occurred through the shift from a reductive atmosphere containing ammonia to an oxidative atmosphere containing carbon dioxide in the presence of oxygen. C K D

A79-37938 **Incorporation of sulphur in chemical evolution** F Raulin (Paris XII, Université, Creteil, Val-de-Marne, France) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977* Tokyo, Center for Academic Publications Japan, 1978, p. 177-185 30 refs

The incorporation of sulfur into organic precursors of biologically important molecules under primitive conditions was studied. CH₄-N₂-H₂S and CH₄-NH₃-H₂S atmospheres were submitted to an electric glow discharge, and organic products were identified. H₂S

was found to inhibit the synthesis of nitriles and hydrocarbons, although this effect was less pronounced in the atmosphere containing ammonia. Ammonia seems to interfere in the reaction mechanisms of H₂S and favor its decomposition. The inhibitory effect of H₂S is much less pronounced when this compound accounts for less than 10 percent of the mixture. The presence of H₂S in the primeval earth atmosphere with a molar ratio of about 0.01 could have permitted the formation of volatile S-containing compounds. Studies on the reaction of alkanethiols with malonic nitriles in aqueous solutions indicate that thioethers and iminothioesters may have been formed under primitive earth conditions. C K D

A79-37945 Prebiotic condensation of oligonucleotide H Sawai (Tokyo, University, Tokyo, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977. Tokyo, Center for Academic Publications Japan, 1978, p. 227-233. 24 refs

The condensation of activated triadenylate in aqueous solution in the presence of divalent metal ions was investigated. Hexaadenylate formation was found to be enhanced by Zn(2+) and Mg(2+). Small amounts of adenosine, adenosine triphosphate, and short oligonucleotides were formed by degradation of tri- and hexaadenylates, especially in the presence of Pb(2+). A study of UV heating curves of complexes on triadenylate and oligouridilates was carried out. Results indicated that the template directed condensation of triadenylate can take place in the presence of a penta-uridilate template at 0°C. This reaction was subsequently carried out, and tri-, hexa- and nonaadenylates were obtained. No oligonucleotides were detected. C K D

A79-37948 * An approach to the origin of self-replicating system I - Intermolecular interactions R D MacElroy, Y Coeckelenbergh (NASA, Ames Research Center, Extraterrestrial Biology Div., Moffett Field, Calif.) and R Rein (Roswell Park Memorial Institute, Buffalo, N.Y.) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977. Tokyo, Center for Academic Publications Japan, 1978, p. 249-254. 33 refs

The present paper deals with the characteristics and potentialities of a recently developed computer based molecular modeling system. Some characteristics of current coding systems are examined and are extrapolated to the apparent requirements of primitive prebiological coding systems. V P

A79-37957 A simple analogical model for the selection of optical activity and of the most efficient catalysts in the course of molecular evolution R Buvet (Paris XII, Université, Creteil, Val de Marne, France) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977. Tokyo, Center for Academic Publications Japan, 1978, p. 321-324.

A79-37959 Quantitative aspects of the effect of weak interaction during chemical evolution J Czege, C Fajsz, and L Keszthelyi (Magyar Tudományos Akadémia, Biológiai Központ, Szeged, Hungary) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977. Tokyo, Center for Academic Publications Japan, 1978, p. 333-338. 16 refs

An attempt is made to determine quantitatively whether selective interactions of longitudinally polarized beta particles or the differences in rates of interactions between L and D molecules due to the weak force could cause the observed optical purity of biomolecules on earth. The effects of U, Th and K-40 beta decay and cosmic radiation on amino acids in the sea are considered in the derivation of an expression for the magnitude of the difference of the interaction force of beta particles with L and D amino acids necessary to produce a given concentration difference in a given amount of time. According to the calculations, the difference in amino acid concentration will be orders of magnitude smaller than the interaction rate difference. The concentration difference between

L and D molecules produced by the energy difference caused by the weak force is also calculated to be very small (between 10 to the -4th and 10 to the -7th). It is concluded that quantitative estimations do not exclude the weak interaction as a cause of optical activity.

A L W

A79-37960 Coacervate drops as a model for precellular structures K L Gladilin, A F Orlovskii, D B Kirpotin, and A I Oparin (Akademiya Nauk SSSR, Institut Biokhimi, Moscow, USSR) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977. Tokyo, Center for Academic Publications Japan, 1978, p. 357-362. 8 refs

Enzyme-containing coacervate drops are investigated as models for the growth, division and prebiological selection of probionts. Probiont growth was studied in a histone-gum arabic coacervate system containing the enzyme polynucleotide phosphorylase, where the active synthesis of polyA in the drops by the enzyme is found to provide an increase in drop volume. Individual variations in growth rate were observed, which were correlated with individual differences in the ability of the drops to absorb the dye toluidine blue. Drop division was studied in the protamine-polyA coacervate system upon the addition of polyphosphate, and it was observed that polyphosphate penetrating into the original drops initiated the formation of smaller drops, followed by the elimination of polyA. A L W

A79-37962 Coacervate drops - Primitive forms of precells T N Evreinova, V N Karnaukhov, E V Mel'nikova, and B L Allakhverdov (Moskovskii Gosudarstvennyi Universitet, Moscow, Akademiya Nauk SSSR, Institut Biofiziki, Pushchino, USSR) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977. Tokyo, Center for Academic Publications Japan, 1978, p. 369-374. 16 refs

Coacervate drops are examined as models of primitive forms of precells. Interference microscopy has shown that both cells and coacervate drops 0.5 to 5 microns in diameter have a dry mass of about 10 to the -12th g, with similar proportions of water. Generally short-lived coacervate drops have been stabilized by treatment with oxidizing agents, which evidently cause the formation of links between polymer molecules. Scanning electron microscopy has revealed that the drops have membranes, and colonies consisting of drops from different coacervate systems have been observed by luminescent microscopy. Luminescent microscopy has also been used to detect the transfer of photon energy between drops. The coexistence of drops of various types in pre-cell colonies is considered to be an indispensable stage in the evolution of life. A L W

A79-37964 Experimental approach to the chemical evolution in the primeval sea II - Formation of protocell-like structures 'marigranules' in a modified sea medium H Yanagawa and F Egami (Mitsubishi-Kasei Institute of Life Sciences, Machida, Tokyo, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977. Tokyo, Center for Academic Publications Japan, 1978, p. 385-390. 5 refs

Marine media with low concentrations of sodium chloride and high concentrations of transition metal ions such as molybdenum, iron, zinc, copper, cobalt, and manganese have been observed to yield amino acids and related polymers (from formaldehyde and glycine) which formed highly organized particles. These organized particles, termed marigranules, were separated out after long incubation. Three configurations for the marigranules were noted: spheroidal structures 10 microns in length, structures with clusters of various sizes, and spherical forms 0.3 to 2.5 microns in diameter. The marigranules may be considered protocell structures similar to the coacervate droplets described by Oparin (1924). J M B

A79-37965 Takeover mechanisms and early biochemical evolution A G Cairns-Smith (Glasgow, University, Glasgow, Scotland) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p. 399-404 13 refs

The possible role of takeovers of the function of one biochemical structure by an unrelated structure in early biochemical evolution is discussed. Takeovers during early biochemical evolution would have tended to disconnect successions of structures with a given function, leaving few traces of the former mechanism. Protein is considered as one such structure which may have taken over the recognition and control functions of other, possibly structural, forms of organization concurrently with the evolution of the highly specific protein synthesis mechanism. Nucleic acids are also seen as possible secondary genetic materials, being primary structural materials which have taken over the genetic functions of other materials with the aid of proteins. A recognition of the possible role of takeovers in early biochemical evolution would remove many theoretical constraints on the explanation of the prebiotic origin of life. A L W

A79-37966 Evolutionary relationship based on a biochemical study of energy-acquiring system between *Nitrosomonas europaea* and *Thiobacillus novellus* T Yamanaka (Osaka University, Toyonaka, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p. 405-409 12 refs

The evolutionary relationships between the ammonia-oxidizing bacterium, *Nitrosomonas europaea*, and the thiosulfate-oxidizing bacterium, *Thiobacillus novellus*, are determined by an examination of their electron transport systems. The reactivities of the cytochromes c of the two species with several redox enzymes indicate that *N. europaea* cytochrome c is of a bacterial type, while *T. novellus* cytochrome c is similar to eukaryotic cytochrome c. *N. europaea* cytochrome oxidase reacts with both eukaryotic and bacterial cytochrome c, while *T. novellus* cytochrome oxidase reacts only with eukaryotic forms of cytochrome c. The reactivities of the cytochrome c peroxidases of the bacteria are also found to follow this pattern. It is concluded that *N. europaea* is evolutionarily older than *T. novellus*. A L W

A79-37967 Sulfate-reducing bacteria and biochemical evolution K Kobayashi, Y Seki, E Katsura, and M Ishimoto (Hokkaido University, Sapporo, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p. 421-426 36 refs

Recent findings on the enzyme systems and the electron transport chain in bacteria which reduce sulfate to sulfide as the final step in oxidative phosphorylation are discussed in relation to the evolution of primitive microorganisms. Sulfate-reducing bacteria have been found to reduce sulfate to sulfite by means of the activated form of sulfate, adenosine-5'-phosphosulfate, rather than 3'-phosphoadenosine-5'-phosphosulfate, as in photosynthetic sulfate assimilation. The porphyrin prosthetic group on the sulfide-forming sulfite reductase in photosynthetic organisms and the α -ketoglutarate-forming sulfite reductase in sulfur bacteria have been found to be identical. The electron carriers flavodoxin and cytochrome c3 have been detected in sulfur bacteria, as well as in a number of other strict anaerobes, indicating that sulfate-reducing and photosynthetic bacteria probably evolved from a common ancestor. A L W

A79-37968 Nitrate fermentation in *Clostridium perfringens* and significance in metabolic evolution. M Ishimoto and S Seki Chiba (Hokkaido University, Sapporo, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p. 427-430 12 refs

Nitrate formation and nitrate respiration (or sulfate respiration in sulfate-reducing bacteria) have been considered possible means for

energy production in early life forms. In this paper, nitrate reduction by the anaerobe *Clostridium perfringens* is studied, with particular attention given to the role of nitrate reductase in the organism's energy production process. The reduction of nitrate in glucose fermentation by *C. perfringens* was found to entail increased acetate production and increased molar growth yield. Nitrate reductase formation was induced by nitrate; nitrate reductase is a soluble molybdo-protein with a molecular weight of 90,000. J M B

A79-37969 Control by episome on salt-resistance in bacteria. H Morishita (Osaka City Institute of Public Health and Environmental Science, Osaka, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p. 431-439 14 refs

The control exerted by the episome, or plasmid, over the ability of bacteria to adapt to environments of various salinities is investigated. The SR(+) strain of the marine bacterium *Spirillum lunatum* was observed to be able to grow in both fresh water and 1.0 M NaCl, growing best in a 0.3 M NaCl solution. The strain was found to exhibit salt resistance and ionic osmoregulatory ability in a hypertonic environment. The salt-resistance as well as the ability of the bacteria to utilize maltose were lost when treated with the plasmid-curing agents acriflavine, sodium dodecylsulfate and phenethyl alcohol, leaving a mutant strain which had lost osmoregulatory ability in a hypertonic environment. Results indicate the controlling activity of the plasmid in saline adaptation, which may have implications in the study of evolutionary adaptation in a changing environment. A L W

A79-37970 Evolution of enzyme function - The coupled oscillator theory J L Fox and M D Williams (Texas, University, Austin, Tex.) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p. 441-446 14 refs NSF-supported research

A theory based on oscillators and their resulting waveforms is employed to describe biological structures, in particular substrates and enzymes. The structures are represented as oscillators capable of emitting and receiving EM waves, waves with the same oscillating frequency and phase relationships can couple by resonance and produce amplification. Biological structures modeled by the coupled oscillator theory undergo an evolutionary process. Raman spectra may be adopted to study the nature of the structures. J M B

A79-37971 Possible contribution of transferable exogenous DNA in prokaryotic evolution M Higuchi, M Higuchi, and S Araya (Tohoku University, Sendai, Japan) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting*, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p. 447-454 14 refs

Mutations caused by the transfer of plasmids in bacteria are discussed as a model for the possible contributions of the transfer of exogenous DNA to prokaryotic metabolic evolution. A strain of streptococcus mutans bacteria with a mucoid appearance is observed to mutate to a strain of cells having rough surfaces, accompanied by changes in electron transfer system enzymes, carbohydrate metabolism and membrane structure in a manner similar to phylogenetic differentiation. The mutations are found to occur upon the deletion of the plasmid from mucoid cells and are reversed when rough type cells are transfected with phage DNA from mucoid cells. By this model, differentiation of cell membranes and metabolic functions in prokaryotes may have resulted from the incorporation of environmental DNA fragments synthesized abiotically or released from other cells. A L W

A79-37972 * The point mutation process in proteins R M Schwartz (National Biomedical Research Foundation, Silver Spring, Md.) and M O Dayhoff (National Biomedical Research Foundation, Silver Spring, Md., Georgetown University, Washington, D C) In *Origin of life, Proceedings of the Second ISSOL Meeting and Fifth*

ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 457-469
12 refs Contract No NASw-3019, Grants No NIH-GM-08710, No NIH-RR-05681

An optimized scoring matrix for residue by-residue comparisons of distantly related protein sequences has been developed. The scoring matrix is based on observed exchanges and mutabilities of amino acids in 1572 closely related sequences derived from a cross-section of protein groups. Very few superimposed or parallel mutations are included in the data. The scoring matrix is most useful for demonstrating the relatedness of proteins between 65 and 85% different. J M B

A79-37973 Some characteristic features of the origin and evolution of the amino acid composition of proteins - A theoretical consideration K Ohnishi (Niigata University, Igarashi, Japan) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 471-477
31 refs Research supported by the Ministry of Education of Japan

A79-37974 Nucleotide-binding site data and the origin of the genetic code G W R Walker (Alberta, University, Alberta, Canada) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 479-488 9 refs

Nucleotide-binding site data have been examined to determine the amino acids which were coded into the ancestral single surface, dated between 3.2 and 4.5 billion years ago. The study has significance for understanding recent hypotheses concerning primeval genetic coding and investigations of amino acid substitution. In particular, the findings provide limited support for Jukes' (1973) postulated expansion of a 10 amino acid code to the present one through genesis of transfer RNA base-modifying enzymes. However, the present study suggests a degree of randomness in codon expansion not foreseen in Jukes' hypothesis. J M B

A79-37975 Evolution of transfer RNA M Hasegawa (Ministry of Education, Institute of Statistical Mathematics, Tokyo, Japan) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 495-500 21 refs

Base sequences of transfer RNAs (tRNAs) from eukaryotes, prokaryotes and organelles are compared in order to derive the phylogenetic relations of tRNA and to understand its evolution. The homology among all tRNA sequences and the universality of the cloverleaf structure indicate a single common origin of tRNA. It has been shown that tRNA sequences are much more conservative than any proteins analyzed except for histone IV, attributed to its roles in protein synthesis and enzyme regulation. A phylogenetic tree of tRNA sequences, constructed using a maximum parsimony method, shows that except for initiator tRNA, tRNAs for a particular amino acid from prokaryotes or eukaryotes are more closely related to tRNAs for different amino acids from the same taxon than to the tRNAs for the same amino acid from the other taxon, indicating a high rate of nucleotide substitution during the transition from prokaryotes to eukaryotes. The tRNA from the sole chloroplast investigated is found to be prokaryotic, supporting the symbiotic theory of organelle origin. A L W

A79-37976 Structure-stability relationship of thermophile tRNA - A model for biological adaptation and limit of life at high temperature T Oshima, K Watanabe (Mitsubishi Kasei Institute of Life Sciences, Machida, Tokyo, Japan), and S Nishimura (Ministry of Health and Welfare, National Cancer Centre, Tokyo, Japan) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 509-514
16 refs

Molecular mechanisms of thermophily have been studied in an extremely thermophilic bacteria *Thermus thermophilus*, isolated in a hot spring, such bacteria are of interest in examining the hypothesis that thermophilic organisms were the earliest forms of terrestrial life. An increase in the guanine-cytosine pair content in the base-paired region, together with thiolation of thymine-55 to 5-methyl-2-thiouracil, appears to provide a high-temperature stability for the transfer RNA of *T. thermophilus*. The evolutionary relationship between thermophilic bacteria and bacteria with less stability to heat is discussed. J M B

A79-37977 Membranous evolution in the primitive cell H Nakamura (Konan University, Kobe, Japan) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 515-520 11 refs

When phospholipids are dispersed in water, lipid bilayers and spherules are readily formed, this finding suggests a possible origin for prebiotic membranes in a primitive marine environment. In addition, genetic interaction among mitochondria and chloroplasts is discussed. It is shown that these organelles are not symbionts and not self-reproducing. The evolution of the plasma membrane from prokaryotic and eukaryotic cells to present organisms also receives consideration. J M B

A79-37978 Subcellular organisms and evolution of cell structure V J A Novak (Ceskoslovenska Akademie Ved, Mikrobiologicky Ustav, Prague, Czechoslovakia) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 521-525 15 refs

A continuous series of transitions can be detected from the simplest replicating viroid-type nucleic acid molecules to the phylogenetically lowest prokaryotic cell. This view contradicts the degradation theory, according to which a progressive simplification is found in the body of subcellular parasites. Phylogenetic relationships between structures of viroids, bacteriophages, and helical and icosahedral viruses are proposed. The applicability of general laws of evolution to subcellular organisms is asserted. J M B

A79-37979 Epimerization of L-isoleucine on Na-montmorillonite and its implication to Precambrian chemical fossils M Akiyama (Hokkaido University, Sapporo, Japan) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 541-545 9 refs

A79-37980 * Evolution of early life inferred from protein and ribonucleic acid sequences M O Dayhoff (National Biomedical Research Foundation, Georgetown University, Washington, D C) and R M Schwartz (National Biomedical Research Foundation, Washington, D C) In Origin of Life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan, 1978, p 547-560 34 refs Contract No NASw-3019, Grants No NTH-GM-08710, No NIH-RR-05681

The chemical structures of ferredoxin, 5S ribosomal RNA, and c-type cytochrome sequences have been employed to construct a phylogenetic tree which connects all major photosynthesizing organisms: the three types of bacteria, blue-green algae, and chloroplasts. Anaerobic and aerobic bacteria, eukaryotic cytoplasmic components and mitochondria are also included in the phylogenetic tree. Anaerobic nonphotosynthesizing bacteria similar to *Clostridium* were the earliest organisms, arising more than 3.2 billion years ago. Bacterial photosynthesis evolved nearly 3.0 billion years ago, while oxygen-evolving photosynthesis, originating in the blue-green algal line, came into being about 2.0 billion years ago. The phylogenetic tree supports the symbiotic theory of the origin of eukaryotes. J M B

A79-37981 The study of the origin of life - Results and prospects A I Oparin (Akademii Nauk SSSR, Institut Biokhimi, Moscow, USSR) In Origin of Life, Proceedings of the Second ISSOL

Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977
Tokyo, Center for Academic Publications Japan,
1978, p 563-567

The results of investigations of chemical and prebiotic evolution are reviewed and prospects for future research are discussed. Although studies of the formation of organic compounds under present terrestrial conditions are complicated by the effects of biological processes and have so far been insufficient, model experiments have demonstrated the possibility of abiotic synthesis of organic materials under various suspected primitive earth conditions. The greatest problem remains that of explaining the transition from chemical evolution to biological forms of organization. It is argued that the intrinsically organized protein and nucleic acid molecules could not have evolved independently of the cellular environment to which they are so finely adjusted, but instead must have emerged in the process of natural selection of the organism as a whole. The separation of multimolecular phase-separated systems from an external homogeneous solution has been observed in coacervate drops, which have also demonstrated primitive forms of natural selection. Further work is indicated on the improvement of models of primitive biological evolution and the comparative metabolisms of primitive forms of life. A L W

A79-37982 The crisis in the problem of the origin of life
J Keosian (Woods Hole Oceanographic Institution, Woods Hole, Mass.) In Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978,
p 569-574 27 refs

Molecular and chemical evolution theories of the origin of life, as well as heterotroph hypotheses concerning the form of original life, are examined and found defective. One of the difficulties of molecular theories is that they require accidental formation of a highly complex molecule, in addition, it is not possible that genes or self-replicating acids could have served as the ancestors of living things. Chemical evolution theories present problems in that they assume prebiotic water with biochemical compounds, energy metabolism, polymerization and transcription and translation apparatus similar to those found in environments with life. Heterotroph hypotheses, such as that proposed by Horowitz (1945), require the formation of organisms of great metabolic complexity, an unlikely occurrence in the prebiotic medium. J M B

A79-37983 The importance of the physical laws on the origin and evolution of life. M D Papagiannis (Boston University, Boston, Mass.) In Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan,
1978, p 575-581

The physical conditions necessary for the origin and evolution of life are discussed. The basic properties of the universe necessary for the appearance of life are considered to be matter able to form the complex structures needed for living processes, and a steady supply of stellar energy over the time required for biological evolution. The interactions of the four fundamental particles (proton, neutron, electron, neutrino) with the four fundamental forces (nuclear, electromagnetic, weak-interaction, gravitational) have given rise to the chemical structures necessary to life, including the abundant and probably essential elements of carbon and oxygen and the water molecule, as well as to long lived hydrogen-burning stars. It is also necessary that the energy sources be compatible with the chemical structures of living organisms. The delicate balance observed between these forces and particles, allowing the presence of life, is considered to indicate a predisposition of the universe towards the origin of life and the evolution of intelligence. A L W

A79-37985 A critical assessment of the origin of life. J Brooks and G Shaw (Bradford, University, Bradford, Yorks, England) In Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan,
1978, p 597-606 38 refs

The theory of chemical evolution for the origin of life on earth is assessed by an examination of the geological evidence. It is argued that although experiments have shown that the formation of organic monomers and their polymerization under primitive earth conditions was possible, they do not furnish proof that these processes actually occurred. An examination of the organic materials in ancient sediments reveals no evidence of an organic 'primeval soup' which would inevitably have formed nitrogenous organic deposits and nitrogenous cokes in the Precambrian rocks if the postulated accumulation of abiotically formed amino acids and nucleic acid bases were indeed taking place. Banded iron formations of biological origin and the remains of photosynthesizing microorganisms have been found in sediments dating from four billion years ago, leaving an extremely short time for the proposed chemical evolution to have occurred after the earth had cooled sufficiently. It is thus suggested that life on earth may have had an extraterrestrial origin. A L W

A79-37986 The origin of the protein synthesis mechanism

M Ishigami, K Nagano, and N Tonotsuka (Jichi Medical School, Tochigi, Japan) In Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan,
1978, p 607-615 17 refs

A model of the sequential processes which lead to the establishment of the mechanism by which proteins are synthesized by living organisms is proposed. In the first step of the process, nucleotides served to activate amino acids and accelerate polypeptide polymerization. In the second step, soluble polynucleotides (the primitive tRNAs) having the less common G or C bases as anticodons developed a preference for the more abundant amino acids, thus establishing the genetic code. In the next step, primitive rRNAs and mRNAs were differentiated from the insoluble polyribonucleotides and template directed polypeptide synthesis began. In the final step, some of the evolved proteins began to take part in the protein synthesis mechanism, taking over the recognition function from the tRNA. DNA did not appear until a later stage of development.

A L W

A79-37987 Evolution in open systems - Acquisition and conservation of information in bioids

P Decker and W Heidmann (Hannover, Tierärztliche Hochschule, Hannover, West Germany) In Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p 617-623
29 refs

Nucleoprotic systems such as DNA could not have been the original life forms on earth. Instead, nucleoprotic systems had predecessors (termed bioids) which consisted of self-organized primitive metabolic pathways that employed nonstandardized catalysts and accumulated noncoded information in the form of kinetic feedback structures. The autocatalytic formation of sugars from formaldehyde has been examined as a possible bioid in a primitive reducing, methane-containing atmosphere. This autocatalytic reaction could have resulted in the formation of kerogen, a ubiquitous insoluble organic component of sedimentary rocks. J M B

A79-37989 Inverse assimilation - A general principle of evolution of planetary surfaces.

P Decker (Hannover, Tierärztliche Hochschule, Hannover, West Germany) In Origin of life, Proceedings of the Second ISSOL Meeting and Fifth ICOL Meeting, Kyoto, Japan, April 5-10, 1977

Tokyo, Center for Academic Publications Japan, 1978, p 631-637 20 refs

A reductive carbon cycle between CH₄ and biomass, involving the photooxidation of CH₄ coupled with the evolution (or inverse assimilation) of H₂, together with reductive dissimilation of biomass by H₂ into CH₄, could have maintained an elevated H₂ level in the primeval reducing atmosphere of earth. The H₂ maintenance mechanism is similar to the oxidative carbon cycle between CO₂ and biomass which maintains the present terrestrial O₂ atmosphere. The inverse assimilation mechanism could account for the oxidation of the earth's crust and atmosphere and might explain how photo-

synthesis evolved in a reducing atmosphere. The inverse assimilation theory could also model biogenic consumption of a planetary atmosphere resulting in conditions like those observed on Mars

J M B

A79-38146 # The effect of hyperoxia on the oxygen tension of blood and cerebral tissue (Vlianie giperoksii na napriazhenie kisloroda v krvi i tkani mozga) A I Selivra (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Apr 1979, p 513-520 19 refs In Russian

Changes in the oxygen tension of arterial blood and tissues of the surface layers of the cerebral cortex of anesthetized rabbits under conditions of hyperoxia were studied with the aid of closed-type electrodes. An increase of oxygen partial pressure from 0.2 to 6.0 kg/sq cm increased oxygen tension in the cerebral cortex from 34.9 plus or minus 12.0 to 108.7.5 plus or minus 149.8 mm Hg. Raising the partial pressure of oxygen to 1 and 2 kg/sq cm produced increases in the oxygen tension of arterial blood from about 76.5 to about 472.3 and 1138.0 mm Hg, respectively. Defense reactions were observed at transfer to pure oxygen and were at a level of high efficacy as the oxygen partial pressure was raised to 3.0 kg/sq cm. Further increases were met with decreased defense mechanisms. Prolonged exposure at lower partial pressures also induced a weakening of defense reactions. The statistical correlation between fluctuations in oxygen tensions of the blood and the cerebral cortex reflects an increase in the dependence of cerebral circulation on the circulation system in general, the physiological mechanism may resemble the disruption of autoregulation of the cerebral circulatory system observed in hypoxia and hypercapnia

C K D

A79-38147 # The effect of thermal stimulation of the skin on activity of lateral crescent interneurons of lumbar segments (Vlianie temperaturnykh razdrzhenii kozhi na aktivnost' interneuronov bokovogo roga poiasnichnykh segmentov spinnogo mozga) S Zh Tleulin (Akademiia Nauk Kazakhskoi SSR, Institut Fiziologii, Alma-Ata, Kazakh SSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Apr 1979, p 543-548 16 refs In Russian

The response of lateral interneurons of lumbar segments of anesthetized cats to heating and cooling of the skin of a hind leg was investigated. The interneuron response was registered with microelectrodes and displayed on an oscillograph. The interneurons exhibited a reciprocal response to heating and cooling of the skin of lower extremities analogous to that induced by cooling of cutaneous nerve sympathetic fibers

C K D

A79-38148 # Neural regulation of coronary circulation (Nervnaia regulatsiia koronarnogo krovoobrashcheniia) A I Khomaziuk (Kievskii Nauchno-Issledovatel'skii Institut Endokrinologii i Obmena Veshchestv, Kiev, Ukrainian SSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Apr 1979, p 589-597 16 refs In Russian

The mechanisms of neural regulation of coronary circulation were investigated. The coronary arteries and vessels of anesthetized dogs were catheterized and the arteries were perfused with heparinized blood. Blood pressure, resistance of coronary and peripheral vessels, oxygen saturation of blood in the aorta and coronary sinus, respiration and biopotentials were monitored using a 6-8 channel polygraph or an electrokymograph. Tonal effects of the nervous system on the coronary vessels were found to be insignificant, resistance being maintained by the high basal tone, the main tonic influence of the sympathetic and parasympathetic systems is accomplished by changes in the functions and metabolism of the myocardium. The regulation of coronary vessels is based on regional reflex correction of the basal tone. The adrenergic effect on the heart is accompanied by reflex dilation of coronary vessels by cholinergic mechanisms. Alphas adrenergic reactions, normally suppressed by cholinergic and autoregulatory metabolic mechanisms, may supplement myocardial autoregulatory mechanisms when perfusion pressure is increased

C K D

A79-38149 # Norepinephrine action on smooth muscle cells of coronary arteries (Deistvie noradrenalina na gladkomyshechnye kletki koronarnykh arterii) S B Shishkin and A G Baranov

(Izhevskii Gosudarstvennyi Meditsinskii Institut, Izhevsk, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Apr 1979, p 606-610 20 refs In Russian

Factors involved in the beta dilatory reaction of noradrenaline on depolarized smooth muscle cells of canine coronary artery segments were investigated. Changes in mechanical activity in response to norepinephrine at a concentration of 8 millionths of a gram per milliliter were studied using a mechanotron in an isometric regime. Norepinephrine at the concentration studied provoked a relaxation of smooth muscle cells which appears to be effected with the aid of the beta-adrenergic receptors. The data indicate that norepinephrine changes the calcium ion transport system in cell membranes with the aid of cyclic AMP

C K D

A79-38150 # The bloodflow in skeletal muscle capillaries in normoxia and arterial hypoxemia /Microcinematographic studies/ (Krovotok v mikrososudakh skeletnoi myshtsy pri normoksii i arterial'noi gipoksemii /Mikrokinematograficheskie issledovaniia/) M K Kalinina, Iu I Levkovich, K P Ivanov, and G P Mikhailova (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Apr 1979, p 620-628 19 refs In Russian

A microcinematographic method was used to study the characteristics of blood flow in capillaries of in situ rat skeletal muscle under conditions of normoxia and hypoxemia (exposure to an atmosphere of nitrogen and 6.8% oxygen for 5 minutes). The average blood flow velocity in normoxia was found to be 1.14 plus or minus 0.04 mm/sec in capillaries and 2.43 plus or minus 0.08 mm/sec in terminal arterioles. Under conditions of hypoxemia a reduction in blood flow velocity was observed in 75% of the vessels studied. The deceleration of capillary blood flow was closely correlated with a drop in arterial pressure. It is suggested that these reactions under conditions of hypoxemia are a mechanism for improving the overall oxygen balance of the organism

C K D

A79-38151 # The response of the microvascular canal to a hypoxic helium-containing medium (Reaktsiia mikrotsirkulatornogo rusla na gipoksicheskuu geliosoderzhashchuiu sredu) Iu I Ibragimov (Tadzhikskii Gosudarstvennyi Meditsinskii Institut, Dushanbe, Tadzhik SSR) *Fiziologicheskii Zhurnal SSSR*, vol 65, Apr 1979, p 629-635 14 refs In Russian

Hemodynamic parameters (vessel dilation and rate of blood flow) of mice breathing a helium-containing hypoxic mixture (90.5% He, 9.5% O₂) were investigated by television microscopy. A decrease in microvessel diameter and flow rate and volume was observed at all points in the microvascular bed. It was found that a hypoxic mixture containing large amounts of helium had a greater depressant effect on hemodynamic parameters than an analogous mixture based on nitrogen

C K D

A79-38357 Visual search for complex targets W H Teichner and J B Mocharnuk (New Mexico State University, Las Cruces, N Mex.) *Human Factors*, vol 21, June 1979, p 259-275 30 refs Contract No N00014-70 A-0147 0002

With the use of available data, search time and stimulus processing rate for a multidimensional target in an array of such stimuli were analyzed with respect to number of displayed stimuli and total stimulus information. The major findings were that search time decreases and stimulus processing rate increases as the number of dimensions in a multidimensional target increases, and that the rate of processing increases as a function of total stimulus information. A model of total stimulus information which assumes sequential processing of dimensions in order of increasing features or levels was found to fit the data

(Author)

A79-38358 Predicting aircraft detectability A Akerman, III and R E Kinzly (Scipar, Inc., Buffalo, N Y.) *Human Factors*, vol 21, June 1979, p 277-291 24 refs Contract No F33615-76-C-1014

A visual search model, VIDEM, has been formulated for predicting the detectability of a single, unknown target in an unstructured surround. The intended application is aircraft detec

tion. The model consists of four components: a liminal contrast threshold, a frequency-of-seeing curve, a soft shell search representation, and discrete cumulation of single glimpse detection probabilities. The formulation was developed by registering five existing models against three controlled search experiments. The five models used represent all appropriate laboratory threshold data, including those of Blackwell, Lamar, Sloan, and Taylor. The search experiments included a large set of aircraft field tests, with precise photometric target measurements correlated to the detection events. The model registrations were done using nonlinear parameter estimation techniques and by comparing model predictions to actual event cumulatives with the Kolmogorov-Smirnov statistic. The resultant VIDEM model is a derivative of Sloan's data, cast into the popular visual lobe equations of Lamar. (Author)

A79-38359 Regression models of search time for color-coded information displays. R. C. Carter (Pennsylvania State University, State College, Pa.) and M.-C. Cahill (Fordham University, Bronx, N.Y.) *Human Factors*, vol. 21, June 1979, p. 293-302. 13 refs.

Visual search time on color-coded information displays has previously been shown to depend upon the number of items displayed (density), the number of colors used (code size), and the number of items in the same color category as the target. The present paper employed regression analysis techniques to develop models of search time which explain the mode of operation of these factors. The initial model, based upon number of items per category as the effective parameter, was successful in explaining 58% of the variation in search time means. An improved model, which introduced the concept, 'operative number of colors', accounted for 84% of the variation. This model was able to predict 82% of the actually obtained search time values within 0.76 s, with no prediction in error by more than 2 s. The elevation in search times with larger display densities and code sizes observed in the data, and described by the improved model, was interpreted in terms of disruption of subjects' scan behavior on the more crowded displays. (Author)

A79-38360 Information transmission during eye movements. A. E. Bartz (Concordia College, Moorhead, Minn.) *Human Factors*, vol. 21, June 1979, p. 331-336. 22 refs. Grant No. PHS-MH-17103.

Target stimuli (the numeral 5 at 60 degrees to the left of the subject's fixation point) were extinguished at various times during the subject's eye movement to that stimulus and the subject was asked to guess what numeral had occurred. Threshold functions were constructed from these data, and it was found that at the beginning of the backward compensatory movement, very little information was transmitted. However, as the backward compensatory movement progressed, there was an increase in the correct identification of the stimulus, and a threshold was reached before the forward compensatory movement began. (Author)

A79-38361 Oculomotor factors in visual perceptual response efficiency. G. Leisman (Sercenco Scientific Systems Corp., Mamaroneck, N.Y.) *Human Factors*, vol. 21, June 1979, p. 337-342. 14 refs. U.S. Veterans Administration Grants No. MRIS-5202-02, No. MRIS-5101-01.

The preprogramming of saccadic eye movements is examined by studying the pattern of oculomotor sequences while scanning a visual display. The effects of interference employing a backward masking paradigm on the oculomotor response as well as on position judgment and stimulus identification are examined. Data indicate that the motor programming of an ocular saccade is linked to the perceptual analysis of target position and cannot be set in motion with an impairment in perceptual localization. (Author)

A79-38362 Dynamics of the eye and head during movement between displays - A qualitative and quantitative guide for designers. G. H. Robinson (Wisconsin, University, Madison, Wis.) *Human Factors*, vol. 21, June 1979, p. 343-352. 16 refs. Contract No. N00014-75-C-0364.

The purpose of this paper is to provide a designer or systems analyst a guide to human performance limitations in vision when fixation must be redirected from one display to another. The focus is on large angular separation (greater than 20 deg) and on tasks wherein speed is of importance. Patterns of eye and head movements are shown, as well as quantitative data on saccades, periods of eye/head compensation, and head movement. Independent variables include interdisplay angle, display visibility, operator's knowledge of display location, and some relevant characteristics of a possible task which must be interrupted for the refixation. Intersubject and intrasubject variability are also presented. (Author)

A79-38363 Methodological considerations of visual workloads of helicopter pilots. R. R. Simmons (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, Ala.) *Human Factors*, vol. 21, June 1979, p. 353-367. 14 refs.

Modifications to and applications of the Eye Mark Recorder corneal reflection apparatus for the assessment of the visual performance and workload of pilots during helicopter operations are presented. The Eye Mark Recorder allows the detection and recording of the viewing point and eye movements by means of an illuminated reticle focused on the cornea and reflected by mirrors. Modifications accomplished to ensure compatibility with the helicopter flight environment include adjustments to the face mask for comfort and stability, a variable power supply, a special mount for the recording camera inside the helicopter and the addition of a blue template to the instrument panel to allow for proper image contrast inside and outside the aircraft. Test and data reduction procedures for use with the apparatus are outlined. The apparatus has been used in simulated instrument flight, actual instrument and visual flights, and nap of the earth and terrain flights and data have been collected on visual, psychomotor and aircraft performance. A. L. W.

A79-38364 Visual workload of the copilot/navigator during terrain flight. M. G. Sanders, R. R. Simmons, and M. A. Hofmann (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, Ala.) *Human Factors*, vol. 21, June 1979, p. 369-383. 8 refs.

The visual workload of the navigator/copilot during terrain flight in a UH-1H helicopter is investigated. Oculomotor performance during nap of the earth, contour and low level flight was recorded by a modified NAC Eye Mark Recorder in conjunction with a 16 mm high speed motion picture camera. Data indicate little variation between time spent at each visual area for different flight tasks. Visual cues needed for navigation were primarily obtained from terrain viewed from the copilot's windscreen, with frequent reference to the handheld map. It is found that the duty of navigating required 92.2% of the copilot's visual time, while the engine and flight instruments were utilized only 4.0% of the time, a visual free time task was utilized only 3% of the time, mostly during hover periods. A. L. W.

A79-38820 # Analysis of electroencephalogram during psychomotor performance. Y. Kurihara, M. Goto, and I. Saito (Japan Air Self Defense Force, Aeromedical Laboratory, Tachikawa, Japan) *Japan Air Self Defense Force, Aeromedical Laboratory, Reports*, vol. 19, Dec. 1978, p. 91-99. 12 refs. In Japanese, with abstract in English.

A79-38821 # Measurements of pilot workload during low altitude and high speed maneuvers of F-1 supersonic jet fighter. O. Fujiwara, I. Sakurai, and Y. Kakimoto (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan) *Japan Air Self Defense Force, Aeromedical Laboratory, Reports*, vol. 19, Dec. 1978, p. 101-113. 9 refs. In Japanese, with abstract in English.

In a study designed to reveal the relationships between the mental workload of F-1 jet fighter pilots and flight altitude, four pilots flew four different altitude flights (5000, 2000, 1000, and 500 ft), performing the same mission with the same flight patterns. Changes in heart and voice characteristics of the vibration-space shift rate (VSSR) were measured. The heart rate was found to increase as the flight altitude decreased. The heart rate showed mission-

dependent behavior, and in the case of the easiest mission the increase in heart rate as altitude decreases is minimal. The analysis of VSSR showed that the emotional state during flight maneuver had no significant differences at the three higher altitudes, but at 500 ft the psychophysiological tension increased greatly. P T H

A79-38822 ; Personality characteristics of pilots on EPPS, MPI and DQSEFU test II - Comparison among pilots, non-pilot officers and aviation students. M Okaue and K Niwa (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan) *Japan Air Self-Defense Force, Aeromedical Laboratory, Reports*, vol 19, Dec 1978, p 115-124. 7 refs. In Japanese, with abstract in English.

A79-39075 * Abundance of organic compounds photochemically produced in the atmospheres of the Outer Planets. F Raulin, A Bossard, G Toupance (Paris XII, Université, Creteil, Val-de-Marne, France), and C Ponnampuruma (Maryland, University, College Park, Md) *Icarus*, vol 38, June 1979, p 358-366. 21 refs. Research supported by the Centre National d'Etudes Spatiales, Grant No NGR-21 002 317.

Organic photochemical syntheses in the Jovian atmosphere were simulated by irradiating, at 147 nm, gaseous mixtures of methane and ammonia with varying amounts of hydrogen. Some results relevant to the photochemistry of the Jupiter atmosphere at several tens of kilometers above the clouds were obtained: (1) a favorable effect of the pressure of high amounts of H₂ on the yield of hydrocarbon synthesis when NH₃ is mixed with CH₄, (2) a very low yield of synthesis of unsaturated hydrocarbons in such conditions, and (3) the possibility of formation of detectable amounts of HCN and CH₃CN. B J

A79-39087 The visual perception of motion in depth. D Regan, K Beverley, and M Cynader (Dalhousie University, Halifax, Canada) *Scientific American*, vol 241, July 1979, p 136, 137, 140-145, 148-151.

A series of psychophysical experiments carried out to determine how the visual system of an individual processes cues to motion in depth is described. Electronic techniques for generating visual stimuli were used to investigate these cues to motion in depth in combination with and in competition against a variety of related stimuli. Results indicate that information concerning motion in depth is processed in two distinct channels, which converge on a single motion-in-depth stage of the human visual perception system. C K D

A79-39506 Specific problems in cardiovascular fluid dynamics measurements. C Oddou (Paris VII, Université, Paris, France). In *Dynamic measurements in unsteady flows*, Proceedings of the Dynamic Flow Conference, Marseille, France, September 11-14, 1978 and Baltimore, Md, September 18-21, 1978.

Skovlunde, Denmark, Proceedings of the Dynamic Flow Conference 1978, 1979, p 645-663. 23 refs.

The application of the physics of fluids to the study of hemodynamical features such as vortices, wave propagation, and hydrodynamic instabilities is discussed. Techniques currently in use of making cardiovascular fluid dynamics measurements, including cineangiography, echocardiography, Doppler shift detection, and associated data processing methods are described. The utilization of these techniques in investigating such problems as the relation between flow field microstructure with thrombogenic mechanisms and the association of recirculation zones and vortex formation with aneurysms and stenoses is examined. C K D

A79-39509 Disorder in pulsatile flow - Biomedical measurements with hot film, laser and ultrasound anemometers. D P Giddens (Georgia Institute of Technology, Atlanta, Ga). In *Dynamic measurements in unsteady flows*, Proceedings of the Dynamic Flow Conference, Marseille, France, September 11-14, 1978 and Baltimore, Md, September 18-21, 1978.

Skovlunde, Denmark, Proceedings of the Dynamic Flow Conference 1978, 1979, p 705-735. 32 refs. NSF-NIH-supported research.

Biomedical measurements of flow and velocity may require a variety of instrumentation methods. The case of disordered velocities occurring in pulsatile flows downstream of localized atherosclerotic plaques is selected as an example for consideration. The hot film, laser and ultrasound anemometers are brought to bear upon studies in laboratory models, animals and humans to illustrate the advantages, limitations and complementary nature of these tools for cardiovascular flow measurements. Example results from each method are given and their interrelationship is discussed. (Author)

A79-39601 Rhythms in human performance - 1-1/2-hour oscillations in cognitive style. R Klein and R Armitage (Dalhousie University, Halifax, Canada) *Science*, vol 204, June 22, 1979, p 1326-1328. 25 refs. Research supported by the National Research Council of Canada.

Performance on verbal and spatial matching tasks was assessed every 15 minutes for 8 hours. Significant 90 to 100 minute oscillations were observed for each task. These oscillations were 180 deg out of phase, supporting the hypothesis that in humans the basic rest activity cycle involves alternating activation of processing systems residing in the two cerebral hemispheres. (Author)

A79-39973 Homomorphic analysis and modeling of ECG signals. I S N Murthy (Indian Institute of Science, Bangalore, India), K J Udupa (New York, State University, Buffalo, N Y), A K Goyal (Indian Telephone Industries, Ltd, Allahabad, India), and M R Rangaraj *IEEE Transactions on Biomedical Engineering*, vol BME-26, June 1979, p 330-344. 14 refs. Research supported by the Electronic Commission of India.

Homomorphic analysis and pole-zero modeling of electrocardiogram (ECG) signals are presented. Four typical ECG signals are considered and deconvolved into their minimum and maximum phase components through cepstral filtering, with a view to study the possibility of more efficient feature selection from the component signals for diagnostic purposes. The complex cepstra of the signals are linearly filtered to extract the basic wavelet and the excitation function. The ECG signals are, in general, mixed phase, and hence exponential weighting is done to aid deconvolution of the signals. The basic wavelet for normal ECG approximates the action potential of the muscle fiber of the heart and the excitation function corresponds to the excitation pattern of the heart muscles during a cardiac cycle. The ECG signals and their components are pole-zero modeled and the pole-zero pattern of models can give a clue to classify the normal and abnormal signals. Besides, storing only the parameters of the model can result in a data reduction of more than 3:1 for normal signals sampled at a moderate 128 samples/s. (Author)

A79-39974 The use of synchronous demodulation for the measurement of eye movements by means of an ocular magnetic search coil. J G McElligott, M H Loughnane (Temple University, Philadelphia, Pa), and L E Mays (Alabama, University, Birmingham, Ala) *IEEE Transactions on Biomedical Engineering*, vol BME 26, June 1979, p 370-374. 11 refs. Grant No NIH 10488.

The paper describes an eye position monitoring system that can be built using inexpensive components for the demodulator. It uses a two-frequency (f and 2f) technique which provides excellent channel separation with a minimum of adjustment and wide dynamic signal range. Phasing errors produce no crosstalk effects for a pure sine-wave signal. It should be noted that this system will also work as a single frequency two-phase system, merely by changing the driver unit. A laser reflection technique was used to accurately calibrate the instrument parameters. A statistical behavioral technique is described which is routinely used to calibrate the search coil implanted in the animal. (Author)

STAR ENTRIES

N79-24626# Oak Ridge National Lab Tenn

EMERGENCE OF BIOTECHNOLOGY

Charles D Scott 1978 26 p refs Presented at 16th Ann New Horizons of Sci Briefing Gatlinburg Tenn 13 Nov 1978 (Contract W-7405-eng-26)

(TID-28983) Avail NTIS HC A03/MF A01

A brief review is given of recent new developments in biotechnology The characteristics of bioprocesses discussed include specificity isolation of the biological agent and sophistication and scale of bioprocesses Examples of new areas of application of biotechnology are bioconversion of organic wastes to fuels or chemical feedstocks resource recovery and biophotolysis DOE

N79-24627 Case Western Reserve Univ Cleveland Ohio

A DISCRETE PARAMETER MODEL OF THE HEAD AND NECK WITH NEUROMUSCULAR FEEDBACK Ph D Thesis

Guillermo Gutierrez 1978 253 p

Avail Univ Microfilms Order No 7909433

A discrete two dimensional model of the human head and neck is developed using Lagrangian and Hamiltonian dynamical principles Particular attention is given to the role of the neuromusculature during the spine response to acceleration directed along the mid-sagittal plane The cervical spin and head are modelled by eight rigid masses connected by pin joints The musculature of the neck is simulated by 16 unidirectional force elements The components of this feedback system consist of a muscle spindle represented by a transfer function in the form of a lead-lag filter a gain constant for the spinal cord and pure time delays for the nerve transmission time The system is implemented in a PDP 11/40 computer using FORTRAN language The model parameters are obtained from cervical spine X-rays isometric torque experiments and the published literature A linear acceleration sled is used to validate the model Dissert Abstr

N79-24628 Ohio State Univ Columbus

AN INVESTIGATION OF THE PULSE-SCATTER IMAGING TECHNIQUE FOR MEDICAL ULTRASONIC IMAGING AND TISSUE CHARACTERIZATION Ph D Thesis

Lawrence Dennis Nadel 1978 352 p

Avail Univ Microfilms Order No 7908187

Pulse-Scatter Imaging a new concept in ultrasonic imaging was investigated for specific application to the field of medicine The technique incorporates both scattered energy and pulse-echo signals into a cross-sectional view via linear algebraic image reconstruction in conjunction with a 320+320 pixel computerized tomography gray scale display Dissert Abstr

N79-24629 West Virginia Univ Morgantown

STRESS AND FATIGUE IN THE DRIVING ENVIRONMENT Ph D Thesis

Michael Lester Romansky 1978 581 p

Avail Univ Microfilms Order No 7910911

The relative effects of a moderate or suboptimal level of environment heat and noise stress on human fatigue arising from sources which may not be specifically related to the driving task were studied Data were collected for task performance parameters physiological variables and subjective responses during stress and nonstress conditions Physiological variables that were measured included heart rate heart rate variability galvanic skin response electromyography blood pressure, oral temperature, 17-ketosteroids and 17-hydroxycorticosteroids Evidence of a decrement in task performance altered psychophys-

iological well-being and discomfort and displeasure with the test environment was provided by subjects for the stress condition The findings indicate that the stress condition was more fatiguing to subjects than the nonstress condition Generally subjects experienced more displeasure dissatisfaction and mental and physical discomfort for the stress condition Dissert Abstr

N79-24630*# National Aeronautics and Space Administration Washington D C

MEDICAL SCIENCE IN SIBERIA OXYGEN EXCHANGE IN THE FAR NORTH

V Kulikov and M Yegunova Apr 1979 6 p Transl into ENGLISH from Meditsinskaya Gazeta (USSR) 23 Aug 1978 p 3 Transl by Kanner (Leo) Associates Redwood City Calif (Contract NASw-3199)

(NASA-TM 75391) Avail NTIS HC A02/MF A01 CSCL 06P

Differences in oxygen conditions between the native and migrant Siberian population were studied in relation to respiratory function arterial and venous blood indicators and acid-base indicators Significant adaptation differences were ascertained between the two populations Author

N79-24631*# New York Univ N-Y Dept of Physics

ATMOSPHERIC NEUTRONS Final Report

Serge A Korff Rosalind B Mendell Milton Merker Edward S Light Howard J Verschell and William S Sandie May 1979 188 p refs

(Contract NAS1-10282)

(NASA-CR-3126) Avail NTIS HC A09/MF A01 CSCL 06R

Contributions to fast neutron measurements in the atmosphere are outlined The results of a calculation to determine the production distribution and final disappearance of atmospheric neutrons over the entire spectrum are presented An attempt is made to answer questions that relate to processes such as neutron escape from the atmosphere and C 14 production In addition since variations of secondary neutrons can be related to variations in the primary radiation comment on the modulation of both radiation components is made G Y

N79-24632*# National Aeronautics and Space Administration Washington D C

INVESTIGATIONS ABOUT THE QUANTITATIVE CHANGES OF CARBON DIOXIDE PRODUCTION IN HUMANS REPORT 2 CARBON DIOXIDE PRODUCTION DURING FEVER AND ITS RELATIONSHIP WITH HEAT PRODUCTION

C Liebermeister Dec 1978 54 p refs Transl into ENGLISH from Deut Arch fuer Klin Med (West Germany) v 8 1871 p 153 205 Transl by Sci Transl Serv Santa Barbara Calif (Contract NASw-3198)

(NASA-TM-75452) Avail NTIS HC A04/MF A01 CSCL 06P

Investigations are cited and explained for carbon dioxide production during fever and its relationship with heat production The general topics of discussion are (1) carbon dioxide production for alternating fever attacks (2) heat balance during the perspiration phase (3) heat balance during the chill phase (4) the theory of fever and (5) chill phase for other fever attacks G Y

N79-24633*# General Electric Co Houston Tex

FLUID AND ELECTROLYTE BALANCE MODEL (FEB)

D G Fitzjerrell 24 Jan 1973 16 p

(Contract NAS9-12932)

(NASA-CR-160206) Avail NTIS HC A02/MF A01 CSCL 06P

The effects of various oral input water loads on solute and water distribution throughout the body are presented in the form of a model The model was a three compartment model the three compartments being plasma interstitial fluid and cellular fluid Sodium potassium chloride and urea were the only major solutes considered explicitly The control of body water and electrolyte distribution was affected via drinking and hormone levels R E S

N79-24634*# General Electric Co Houston Tex Space Div

VALIDATION OF A MODEL FOR INVESTIGATING RED CELL

J I Leonard 10 May 1976 29 p refs Presented at the Operations Res Soc of Am (ORSA) Natl Meeting Las Vegas Nev 17-19 Nov 1975 Repr from the ORSA Bull Suppl 2 v 23 1975 29 p
(Contract NAS9-14523 NAS9-12932)
(NASA-CR-160188) Avail NTIS HC A03/MF A01 CSCL 06S

The model both the conceptual model and simulation model provided a convenient framework on which to demonstrate the commonality between such diverse stresses as descent from altitude red cell infusions bed rest and weightlessness The results suggest that all of these stresses induce an increased blood hematocrit leading to tissue hyperoxia and eventual inhibition of the erythrocyte producing circuit until the hyperoxic condition is relieved The erythropoietic system was acting in these situations as if it were an hematocrit sensor and regulator In these terms the decreases in red cell mass during Skylab may be explained in terms of normal feedback regulation of the erythropoietic system in the face of sustained decreases in plasma volume
R E S

N79-24635*# General Electric Co Houston Tex Apollo Systems Dept
USER'S INSTRUCTIONS FOR THE GRODINS' RESPIRATORY CONTROL MODEL USING THE UNIVAC 1110 REMOTE BATCH AND DEMAND PROCESSING
6 Sep 1974 74 p
(Contract NAS9-12932)
(NASA-CR-160225 TIR-741-MED-4024) Avail NTIS HC A04/MF A01 CSCL 06P

The transient and steady state response of the respiratory control system for variations in volumetric fractions of inspired gases and special system parameters are modeled The program contains the capability to change workload The program is based on Grodins respiratory control model and can be envisioned as a feedback control system comprised of a plant (the controlled system) and the regulating component (controlling system) The controlled system is partitioned into 3 compartments corresponding to lungs brain and tissue with a fluid interconnecting patch representing the blood
J M S

N79-24636*# General Electric Co Houston Tex
A LONG TERM MODEL OF CIRCULATION Final Report, 1973-1974
Ronald J White 15 Aug 1974 59 p refs Prepared in cooperation with Mississippi Univ Jackson
(Contract NAS9-12932)
(NASA-CR-147674 TIR-741-MED-4021) Avail NTIS HC A04/MF A01 CSCL 06P

A quantitative approach to modeling human physiological function with a view toward ultimate application to long duration space flight experiments was undertaken Data was obtained on the effect of weightlessness on certain aspects of human physiological function during 1-3 month periods Modifications in the Guyton model are reviewed Design considerations for bilateral interface models are discussed Construction of a functioning whole body model was studied as well as the testing of the model versus available data
J A M

N79-24637*# General Electric Co Houston Tex Apollo Systems Dept
TRANSIENT THERMOREGULATORY MODEL WITH GRAPHICS OUTPUT
D J Grounds 17 Jul 1974 25 p
(Contract NAS9-12932)
(NASA-CR-160217 TIR-741-MED-4011 DM-110T) Avail NTIS HC A02/MF A01 CSCL 06P

A user's guide is presented for the transient version of the thermoregulatory model The model is designed to simulate the transient response of the human thermoregulatory system to thermal inputs The model consists of 41 compartments over which the terms of the heat balance are computed The control mechanisms which are identified are sweating vaso-constriction and vasodilation
J M S

N79-24638*# General Electric Co Houston Tex
USER'S INSTRUCTIONS FOR THE 41-NODE THERMOREGULATORY MODEL (STEADY STATE VERSION)
J I Leonard 25 Jul 1974 33 p
(Contract NAS9-12932)
(NASA-CR-160220 TIR-741-MED-4015) Avail NTIS HC A03/MF A01 CSCL 06P

A user's guide for the steady-state thermoregulatory model is presented The model was modified to provide conversational interaction on a remote terminal greater flexibility for parameter estimation increased efficiency of convergence greater choice of output variable and more realistic equations for respiratory and skin diffusion water losses
J M S

N79-24639*# General Electric Co Houston Tex Apollo Systems Dept
EVALUATION OF EXERCISE-RESPIRATORY SYSTEM MODIFICATIONS AND PRELIMINARY RESPIRATORY-CIRCULATORY SYSTEM INTEGRATION SCHEME Interim Report
R R Gallagher (Kansas State Univ) 16 Jul 1974 25 p refs
(Contract NAS9-12932)
(NASA-CR-160221 TIR-741-MED-4016 MA-252T) Avail NTIS HC A02/MF A01 CSCL 06P

The respiratory control system functioning as an independent system is presented with modifications of the exercise subroutine These modifications illustrate an improved control of ventilation rates and arterial and compartmental gas tensions A very elementary approach to describing the interactions of the respiratory and circulatory system is presented
Author

N79-24640*# General Electric Co Houston Tex Apollo Systems Dept
ACID-BASE HOMEOSTASIS IN THE HUMAN SYSTEM
Ronald J White (University Medical Center Jackson Miss) 16 Aug 1974 25 p refs
(Contract NAS9-12932)
(NASA-CR-12932 TIR-741-MED-4017) Avail NTIS HC A02/MF A01 CSCL 06P

Acid-base regulation is a cooperative phenomena in vivo with body fluids extracellular and intracellular buffers lungs and kidneys all playing important roles The present account is much too brief to be considered a review of present knowledge of these regulatory systems and should be viewed instead as a guide to the elements necessary to construct a simple model of the mutual interactions of the acid-base regulatory systems of the body
Author

N79-24641*# General Electric Co Houston Tex
DESIGN SPECIFICATION FOR THE WHOLE-BODY ALGORITHM
D G Fitzjerrell 9 Sep 1974 13 p refs
(Contract NAS9-12932)
(NASA-CR-160226 TIR-741-MED-4025) Avail NTIS HC A02/MF A01 CSCL 06P

The necessary requirements and guidelines for the construction of a computer program of the whole-body algorithm are presented The minimum subsystem models required to effectively simulate the total body response to stresses of interest are (1) cardiovascular (exercise/LBNP/tilt) (2) respiratory (Grodin's model) (3) thermoregulatory (Stolwijk's model) and (4) long-term circulatory fluid and electrolyte (Guyton's model) The whole-body algorithm must be capable of simulating response to stresses from CO2 inhalation hypoxia thermal environmental exercise (sitting and supine) LBNP and tilt (changing body angles in gravity)
A R H

N79-24642*# General Electric Co Houston Tex
SYSTEMS IDENTIFICATION AND APPLICATION SYSTEMS DEVELOPMENT FOR MONITORING THE PHYSIOLOGICAL AND HEALTH STATUS OF CREWMEN IN SPACE Study Report
J I Leonard S Furukawa and P VanNordstrand 30 Jun 1975 65 p refs
(Contract NAS9-12032)

(NASA-CR-160235 TIR-741-MED-5012) Avail NTIS
HC A04/MF A01 CSCL 06P

The use of automated analytical techniques to aid medical support teams is suggested. Recommendations are presented for characterizing crew health in terms of (1) wholebody function including physiological psychological and performance factors (2) a combination of critical performance indexes which consist of multiple factors of measurable parameters (3) specific responses to low noise level stress tests and (4) probabilities of future performance based on present and periodic examination of past performance. A concept is proposed for a computerized real time biomedical monitoring and health care system that would have the capability to integrate monitored data detect off-nominal conditions based on current knowledge of space-flight responses predict future health status and assist in diagnosis and alternative therapies. Mathematical models could play an important role in this approach especially when operating in a real time mode. Recommendations are presented to update the present health monitoring systems in terms of recent advances in computer technology and biomedical monitoring systems.

J M S

N79-24643*# General Electric Co Houston Tex
PHYSIOLOGICAL SYSTEM INTEGRATIONS WITH EMPHASIS ON THE RESPIRATORY-CARDIOVASCULAR SYSTEM
R R Gallagher (Kansas State Univ) 13 Jan 1975 65 p refs

(Contract NAS9-12932)

(NASA-CR 160230) Avail NTIS HC A04/MF A01 CSCL 06P

The integration of two types of physiological system simulations is presented. The long term model is a circulatory system model which simulates long term blood flow variations and compartmental fluid shifts. The short term models simulate transient phenomena of the respiratory thermoregulatory and pulsatile cardiovascular systems as they respond to stimuli such as LBNP exercise and environmental gaseous variations. An overview of the interfacing approach is described. Descriptions of the variable interface for long term to short term and between the three short term models are given.

M M M

N79-24644*# General Electric Co Houston Tex
STUDY REPORT ON COMBINING DIAGNOSTIC AND THERAPEUTIC CONSIDERATIONS WITH SUBSYSTEM AND WHOLE-BODY SIMULATION

S Furukawa 1 Jul 1975 43 p refs

(Contract NAS9-12932)

(NASA-CR-160231 TIR-741-MED-5006) Avail NTIS
HC A03/MF A01 CSCL 06P

Current applications of simulation models for clinical research described included tilt model simulation of orthostatic intolerance with hemorrhage and modeling long term circulatory circulation. Current capabilities include (1) simulation of analogous pathological states and effects of abnormal environmental stressors by the manipulation of system variables and changing inputs in various sequences (2) simulation of time courses of responses of controlled variables by the altered inputs and their relationships (3) simulation of physiological responses of treatment such as isotonic saline transfusion (4) simulation of the effectiveness of a treatment as well as the effects of complication superimposed on an existing pathological state and (5) comparison of the effectiveness of various treatments/countermeasures for a given pathological state. The feasibility of applying simulation models to diagnostic and therapeutic research problems is assessed.

A R H

N79-24645*# General Electric Co Houston Tex
THE APPLICATION OF SENSITIVITY ANALYSIS TO MODELS OF LARGE SCALE PHYSIOLOGICAL SYSTEMS
Joel I Leonard Oct 1974 67 p refs

(Contract NAS9-12932)

(NASA-CR-160228) Avail NTIS HC A04/MF A01 CSCL 06P

A survey of the literature of sensitivity analysis as it applies to biological systems is reported as well as a brief development

of sensitivity theory. A simple population model and a more complex thermoregulatory model illustrate the investigatory techniques and interpretation of parameter sensitivity analysis. The role of sensitivity analysis in validating and verifying models and in identifying relative parameter influence in estimating errors in model behavior due to uncertainty in input data is presented. This analysis is valuable to the simulationist and the experimentalist in allocating resources for data collection. A method for reducing highly complex nonlinear models to simple linear algebraic models that could be useful for making rapid first order calculations of system behavior is presented.

M M M

N79-24646*# National Aeronautics and Space Administration
Pasadena Office Calif

APPARATUS AND METHOD OF INSERTING A MICROELECTRODE IN BODY TISSUE OR THE LIKE USING VIBRATION MEANS Patent Application

Cyril Feldstein (JPL) Donald W Crawford (JPL) and Evangelyn W Kanabus inventors (to NASA) (JPL) Filed 6 Sep 1976 18 p Sponsored by NASA

(NASA-Case-NPO-13910-1 US-Patent-Appl-SN-712270) Avail NTIS HC A02/MF A01 CSCL 06B

An arrangement for and method of inserting a glass microelectrode having a tip in the micron range into body tissue is disclosed. The top of the microelectrode is attached to the diaphragm center of a first speaker. The microelectrode tip is brought into contact with the tissue by controlling a micromanipulator. Thereafter an audio signal is applied to the speaker to cause the microelectrode to vibrate and thereby pierce the tissue surface without breaking the microelectrode tip. Thereafter the tip is inserted into the tissue to the desired depth by operating the micromanipulator with the microelectrode in a vibratory or nonvibratory state. Means including a second speaker are disclosed.

NASA

N79-24647# Texas Univ at Galveston Comparative Marine
Neurobiology Div

THE EFFECTS OF HIGH NITROGEN TENSIONS OF THE PROPERTIES OF NEURONAL MEMBRANES AND SYNAPTIC TRANSMISSION Final Report, Mar 1973 - May 1977

James E Blankenship Robert Feinstein and Howard J Bryant Jan 1979 41 p refs

(Contract N00014 75-C 0547)

(AD-A063856) Avail NTIS HC A03/MF A01 CSCL 07/2

The effects of increased air nitrogen and/or hydrostatic pressures to 10 ATA have been studied on electrophysiological properties of identified neurons in two model neurobiological preparations: the marine mollusc *Aplysia* and the crayfish. Studies were done in vitro in a pressurization chamber with intracellular recordings using multiple microelectrodes in identified neurons in the *Aplysia* ganglion or from the crayfish giant axon. Ten ATA of air had no demonstrable effect on the resting potential, membrane resistance, time constant or action potential of neurons R2, R14 and R15. *Aplysia* and equivalent pressures of nitrogen or hydrostatic force did not affect resting potential of crayfish axon. The rates of depolarization and repolarization of the crayfish axon action potential were increased significantly by nitrogen tensions to 8.6 ATA: depolarization rate $2.2 \pm 0.2\%$ /atm; repolarization rate $2.1 \pm 0.2\%$ /atm. Action potential duration was decreased ($0.91 \pm 0.19\%$ /atm) under these conditions. Hydrostatic pressure alone had an opposite effect on polarization rates.

GRA

N79-24648# Wayne State Univ Detroit Mich Dept of
Electrical and Computer Engineering

STUDIES ON THE MICROWAVE-INDUCED AUDITORY EFFECT Final Report, 1 Sep 1975 - 28 Feb 1978

James C Lin Feb 1978 80 p refs

(Grant NSF ENG-75-15227)

(PB-290598/2 BES-1) Avail NTIS HC A05/MF A01 CSCL 06P

The mechanism of microwave-induced auditory effect in humans and animals who are exposed to short rectangular pulses of microwave energy is studied. Assuming that the effect arises from sound waves generated in the tissues of the head by rapid thermal expansion caused by microwave absorption the governing thermoelastic motion equation is solved for a spherical model of the head. Results indicate that the frequency of the auditory signal is a function of the size and acoustic property of tissues in the head. Using microwave-induced auditory brainstem responses it found that the experimentally observed characteristics agree well with theoretical prediction in regard to pulse width and frequency of impinging microwaves pattern of absorbed microwave energy frequency of vibration and threshold of sensation. GRA

N79-24649# Tracor Jitco Inc Rockville Md
CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA, A PILOT LITERATURE SURVEY

Randall D Huffman and Cynthia Aller Jan 1979 82 p refs (Contract EPA-68-01-4116)
 (PB-290690/7 EPA-560/6-79-002) Avail NTIS HC A05/MF A01 CSCL 06T

For the past three years the Office of Toxic Substances Monitoring Division involved investigating the establishment of a data base of chemicals identified in human tissues and body fluids. A preliminary computer search in 1976 revealed that adequate descriptors do not exist for retrieving body-burden information from existing computer files and indicated a manual approach would be necessary. The results of a pilot manual literature survey accomplished for the period January 1977 through September 1978 are reported. Fifty-one relevant articles containing information on fifty-three different substances were identified in forty-two selected journals. Data extracted from those articles is organized alphabetically by substance. GRA

N79-24650# National Technical Information Service Springfield Va

AIRCRAFT SONIC BOOM BIOLOGICAL EFFECTS A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Feb 1979

Elizabeth A Harrison Mar 1979 89 p Supersedes NTIS/PS-78/0120 NTIS/PS-77/0171 NTIS/PS-76/0177 and NTIS/PS-75/320
 (NTIS/PS-79/0190/3 NTIS/PS-78/0120 NTIS/PS-77/0171 NTIS/PS-76/0177 NTIS/PS-75/320) Avail NTIS HC\$28.00/MF\$28.00 CSCL 06S

The selected abstracts cover the effects of sonic booms on humans animals birds and fish. Discussions of biophysics psychoacoustics stress and auditory tolerances are presented along with materials on startle responses disturbance and compression wave reactions. (This updated bibliography contains 81 abstracts 4 of which are new entries to the previous edition.) GRA

N79-24651* National Aeronautics and Space Administration Ames Research Center Moffett Field Calif

SPACESUIT MOBILITY KNEE JOINTS Patent

Hubert C Vykukal inventor (to NASA) Issued 1 May 1979 19 p Filed 3 Mar 1978 Supersedes N78-18763 (16 - 09 p 1209) Division of US Patent Appl SN-753965 filed 23 Dec 1976 US Patent-4 091 464

(NASA-Case-ARC-11058-2 US-Patent-4 151 612 US-Patent-Appl-SN-883094 US-Patent-Class-2-2 1A US-Patent-Class-285-235 US-Patent-4 091 464 US-Patent-Appl-SN-753965) Avail US Patent and Trademark Office CSCL 05H

Pressure suit mobility joints are for use in interconnecting adjacent segments of an hermetically sealed spacesuit in which low torques low leakage and a high degree of reliability are required. Each of the joints is a special purpose joint characterized by substantially constant volume and low torque characteristics and includes linkages which restrain the joint from longitudinal distention and includes a flexible substantially impermeable diaphragm of tubular configuration spanning the distance between pivotally supported annuli. The diaphragms of selected joints

include rolling convolutions for balancing the joints while various joints include wedge-shaped sections which enhance the range of motion for the joints.

Official Gazette of the U S Patent and Trademark Office

N79-24652* National Aeronautics and Space Administration Pasadena Office Calif

COMPACT ARTIFICIAL HAND Patent

Gordon A Wiker (JPL) and Wolfgang A Mann inventors (to NASA) (JPL) Issued 17 Apr 1979 7 p Filed 27 Sep 1977 Supersedes N77-32723 Sponsored by NASA (NASA-Case-NPO-13906-1 US-Patent-4 149 278 US-Patent-Appl-SN-837259 US-Patent-Class-3-12 5 US-Patent-Class-3-1 1 US-Patent-Class-414-6) Avail US Patent and Trademark Office CSCL 06B

A relatively simple compact artificial hand is described which includes hooks pivotally mounted on first frame to move together and apart. The first frame is rotatably mounted on a second frame to enable turning at the wrist movement without limitation. The second frame is pivotally mounted on a third frame to permit flexing at the wrist movement. A hook-driving motor is fixed to the second frame but has a shaft that drives a speed reducer on the first frame which in turn drives the hooks. A second motor mounted on the second frame turns a gear on the first frame to rotate the first frame and the hooks thereon. A third motor mounted on the third frame turns a gear on a second frame to pivot it.

Official Gazette of the U S Patent and Trademark Office

N79-24653 Houston Univ Tex

OPERATOR PERFORMANCE AND LOCALIZED MUSCLE FATIGUE IN A SIMULATED SPACE VEHICLE CONTROL Ph D Thesis

James Leon Lewis Jr 1978 86 p
 Avail Univ Microfilms Order No 7910232

Fourier transforms in a special purpose computer were utilized to obtain power spectral density functions from electromyograms of the biceps brachii triceps brachii brachioradialis flexor carpi ulnaris brachialis and pronator teres in eight subjects performing isometric tracking tasks in two directions utilizing a prototype spacecraft rotational hand controller. Analysis of these spectra in general purpose computers established general agreement with previous studies aided in defining muscles involved in performing the task and yielded a derived measure potentially useful in predicting task termination. This technique of relatively non-obtrusive monitoring and analysis has potential practical utility in work station and tool design physical training medical applications and extravehicular pressure-suited work activities for large scale space construction missions. Additional applied research must be conducted to identify derived measures sensitive to the needs of the designer and practically useful in design and real-time applications. Dissert Abstr

N79-24654*# National Aeronautics and Space Administration Hugh L Dryden Flight Research Center Edwards Calif

FLIGHT TEST EVALUATION OF AN RAF HIGH ALTITUDE PARTIAL PRESSURE PROTECTIVE ASSEMBLY

George R Ashworth (System Development Corp Edwards Calif) Terrill W Putnam William J Dana Einar K Enevoldson and William R Winter Jun 1979 37 p ref (NASA-TM-72864) Avail NTIS HC A03/MF A01 CSCL 06K

A partial pressure suit was evaluated during tests in an F-104 and F-15 as a protective garment for emergency descents. The garment is an pressure jerkin and modified anti-g suit combined with an oronasal mask. The garment can be donned and doffed at the aircraft to minimize thermal buildup. The oronasal mask was favored by the pilots due to its immobility on the face during high g-loading. The garment was chosen to provide optimum dexterity for the pilot which is not available in a full pressure suit while protecting the pilot at altitudes up to 18 288 meters during a cabin decompression and subsequent aircraft descent. During cabin decompressions in the F-104 and F-15 cabin pressure altitude was measured at various aircraft angles

of attack Mach numbers and altitudes to determine the effect of the aerodynamic slipstream on the cabin altitude R E S

N79-24655# Aeronautical Research Labs Melbourne (Australia)
IMPACT TESTS ON CRASH HELMETS FOR MOTOR CYCLISTS

N D Hearn and S R Sarraïhe Apr 1978 36 p refs
 (AD-A065966 ARL-Struc-Note-445) Avail NTIS
 HC A03/MF A01 CSCI 14/2

Seven types of crash helmets were subjected to a series of impact tests as detailed in the current Australian Standard Impact accelerations were usually less than 75% of the maximum permitted values but second impacts near the front edge usually resulted in excessive accelerations. Four types of helmets two with fiberglass shells and two with polycarbonate shells were exposed to the weather for 15 to 17 months and one of the polycarbonate shells suffered degradation in its resistance to penetration Author (GRA)

N79-24656# Naval Air Development Center Warminster Pa
 Aircraft and Crew-Systems Technology-Directorate
US NAVY DEVELOPMENT OF AN ON-BOARD OXYGEN GENERATION (OBOG) SYSTEM

Matthew J Lamb 6 Dec 1978 20 p refs
 (AD-A063958 NADC-78257-60) Avail NTIS
 HC A02/MF A01 CSCI 06/11

The Naval Air Development Center has been conducting a development program to explore the On-Board Oxygen Generation (OBOG) concept for application aboard tactical naval aircraft. The objective of the program is to eliminate hazardous and logistically burdensome LOX (liquid oxygen) installations on ships as well as forward basing areas by generation of oxygen on board the aircraft. The purpose of this paper is to report on progress to date in the program which includes (1) Major reduction in values of weight and resource requirements to acceptable levels (2) Development of hardware prototypes of the proposed systems suitable for flight test (3) Aircraft/OBOG systems integration studies (4) Laboratory T and E of the prototype systems (5) Physiological assessment (man rating) of the prototype systems and (6) Flight testing to date GRA

N79-24657# Forschungsinstitut fuer Anthropotechnik Meckenheim (West Germany)

A TWO LEVEL MODEL OF HUMAN STEERING BEHAVIOR IN A MOTOR VEHICLE [EIN ZWEI-EBENEN-MODELL DES MENSCHLICHEN LENKVERHALTENS IM KRAFTFAHRZEUG]

E Donges Mar 1977 178 p refs In GERMAN ENGLISH summary
 (FB-27) Avail NTIS HC A09/MF A01 Forschungsinst fuer Anthropotech Meckenheim West Ger DM 10

In establishing design criteria for vehicle dynamics which may improve the performance of the driver-vehicle system a quantitative description of driver steering behavior was formulated. The steering task was divided into two levels. The guidance level involving the perception of the instantaneous and future course of the forcing function provided by the forward view of the road and the response to it in an anticipatory open-loop control mode and the stabilization level whereby any occurring deviations from the forcing function are compensated for in a closed-loop control mode. This concept of the quality of the driver's steering activity led to a two-level mathematical model of driver steering behavior. Its parameters were identified on the basis of data measured in driving simulator experiments. The parameter estimates of both levels of the model show significant dependence on the experimental situation which can be characterized by variables such as vehicle speed and desired path curvature Author (ESA)

N79-24658*# National Bureau of Standards Washington D C
 Center for Mechanical Engineering and Process Technology
PROXIMITY-VISION SYSTEM FOR PROTOFLIGHT MANIPULATOR ARM Final Report
 James S Albus Jan 1979 22 p

(NASA Order H-30093-B)

(NASA-CR-158652 PB-291335/8 NBSIR-78-1576) Avail
 NTIS HC A02/MF A01 CSCI 13H

The NBS Proximity-Vision System consist of two separate but complementary subsystems (1) a solid-state TV camera with 128 x 128 resolution elements mounted on the manipulator wrist and (2) a pair of close-range infrared proximity sensors mounted in the fingertips. The system is built for a manually controlled teleoperator. The design is also suitable for computer image analysis in the control of an autonomous robot manipulator GRA

N79-25704*# Florida Agricultural and Mechanical Univ
 Tallahassee School of Pharmacy
MICROBIAL TRANSFORMATION OF NUCLEOSIDES Final Report

S S Lamba 1979 17 p
 (Grant NsG-2103)
 (NASA-CR-158696) Avail NTIS HC A02/MF A01 CSCI 06C

A study involving the use of coulter counter in studying the effects of neomycin on E coli S aureus and A aerogenes was completed. The purpose of this was to establish proper technique for enumeration of cells per ml. It was found that inhibitory effects on growth of E coli and A aerogenes both gram negative organisms were directly related to the concentration of neomycin used. However in case S aureus a gram positive organism a decreased inhibition was noted at higher concentrations. A paper entitled Use of Coulter Counter in Studying Effect of Drugs on Cells in Culture 1 - Effects of Neomycin on E coli S aureus and A aerogenes is attached in the appendix. Laboratory procedures were also established to study the effects of nucleoside antibiotic cordycepin on He La cell grown in suspension cultures GY

N79-25705*# Food and Drug Administration Cincinnati Ohio
 Div of Microbiology
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jul 1978 - 30 Sep 1978

A L Reyes and J E Campbell Dec 1978 13 p refs
 (NASA Order W-13411)
 (NASA-CR-158627 QPR-54) Avail NTIS HC A02/MF A01 CSCI 06M

The experiments conducted to determine the heat resistance of Bacillus megaterium ATCC 6458 at 90 and 100 C were completed. Estimates from replicate experiments at eight percent relative humidities (less than 0.001 to 100% RH) for each temperature were computed. A Bacillus cereus strain with high heat resistance was cultured and the resistance determined in phosphate buffer (D sub 121.1 = 2.16 min and z = 8.7 C). The profile of the dry heat resistance of B megaterium is summarized and the most resistant condition to the three spores (Bacillus subtilis var niger ATCC 29669 and Bacillus stearothermophilus strain 1518) is compared GY

N79-25706# Kansas Water Resources Research Inst Manhattan
EFFECTS OF HEAVY METALS ESPECIALLY SELENIUM, VANADIUM AND ZIRCONIUM ON MOVEMENT, GROWTH AND SURVIVAL OF CERTAIN ANIMAL AQUATIC LIFE Completion Report, Oct 1976 - Sep 1978

Eugene C Bovee 28 Jun 1979 29 p refs
 (Contract DI-14-34-0001-7159)
 (PB-292563/4 CONTRIB-199 W79-04592
 OWRT-B-051-KAN(1)) Avail NTIS HC A03/MF A01 CSCI 13B

The heavy metals Selenium Vanadium and Zirconium were tested for potential toxicity to the growth and swimming rates of the ciliated protozoan Tetrahymena pyriformis. Vanadium and Zirconium were found to be less toxic in small amounts than some other metals previously tested. Neither inhibited growth significantly at amounts below five parts per million (5 ppm). Selenium as selenous acid (H2SeO3) slightly stimulated growth at 5 to 15 ppm but as selenite (Na2SeO3) it completely blocked growth at all concentrations tested. All three metals however

inhibited swimming at concentrations over 5 ppm selenium being the more toxic topping swimming in 30 ppm in less than 1 hour. Concentrations of any of the three metals above 20 ppm are detrimental to the growth and survival of *Tetrahymena pyriformis*. GRA

N79-25707 Minnesota Univ Minneapolis
A COMPUTER SYSTEM FOR STATISTICAL ANALYSIS OF EEG TRANSIENTS Ph D Thesis

Hans Otto Lueders 1978 121 p
 Avail Univ Microfilms Order No 7912109

A system is described for the detection and the statistical analysis of EEG transients using computer techniques. The system can be used for quantitative classification of normal and abnormal types of transient activity. EEG wave forms classified by this method can be processed statistically in the following ways: as histograms of time and amplitude variability for any particular type of transient; as histogram of time and amplitude differences between two transients occurring in the same or different channels; as the average standard deviation skewness and kurtosis at any point in time for any particular type of EEG wave form; as a statistical comparison of two or more groups of transients by applying a combination of analysis of variance and student's t-test; and as three-dimensional spatio-temporal display of averaged specific EEG wave forms and their corresponding standard deviations. Dissert Abstr

N79-25708 Medical Coll of Virginia Richmond
RECRUITMENT AND DISCHARGE PROPERTIES OF MOTOR UNITS IN HUMAN BRACHIAL BICEPS AND ADDUCTOR POLICIS DURING ISOMETRIC CONTRACTIONS Ph D Thesis

Carl George Kukulka 1978 125 p
 Avail Univ Microfilms Order No 7912820

Human motor unit recruitment and discharge patterns over the entire range of isometric contractions in a predominately red muscle adductor pollicis and a heterogeneous muscle biceps brachii were examined and evaluated. Using fine wire electrodes intramuscular recordings were obtained for 49 biceps brachii units and 29 adductor pollicis units. In order to discriminate single motor units active at high forces and electronic differentiator was employed both during the experimental sessions and later during data analysis. The discharge patterns of the motor units were evaluated by constructing interspike interval distributions, serial correlograms and autocorrelograms. Dissert Abstr

N79-25709 California Univ Santa Cruz
EFFECTS OF SLEEP AT ALTERED AMBIENT TEMPERATURES ON ELECTROPHYSIOLOGICAL SLEEP AND THERMOREGULATORY MECHANISMS IN HUMAN SUBJECTS AND IN THE GROUND SQUIRREL (CITELLUS LATERALIS) Ph D Thesis

Edwin Holbert Haskell 1978 113 p
 Avail Univ Microfilms Order No 7911941

Hypothalamic thermoregulatory processes are severely curtailed or eliminated during REM sleep in several animal species. Panting, shivering and sweating are among the thermoregulatory mechanisms known to be affected during REM sleep in either humans or in animals. As temperatures deviate from thermoneutrality the ratio of REM sleep to total sleep time decreases. The study was undertaken to examine the effects of sleep at ambient temperatures (T_a) above and below thermoneutrality on (1) electrophysiological stages of sleep and (2) oxygen consumption, skin and rectal temperature and sweat rate in human subjects. Six male subjects slept for a total of 72 nights at 21, 24, 29, 34 and 37 °C. Following 7 adaptation nights at 24, 29 and 34 degrees the subjects spent a total of 5 or 7 experimental nights at the various temperatures. Dissert Abstr

N79-25710 Iowa Univ Iowa City
AORTIC BLOOD FLOW VELOCITY DURING EXERCISE IN MAN Ph D Thesis

Charles Leonardo Carter 1978 217 p
 Avail Univ Microfilms Order No 7912835

The relationship between exercise intensity and peak aortic flow velocity measured noninvasively and reproducibility of

responses at identical work loads were determined. A Doppler system was developed that was capable of resolving flow velocities in excess of 100 cm/sec for an exercise environment. Reproducibility of that system in vitro was demonstrated using both pulsatile and continuous flow in latex and silastic tubing of different diameters and elastic properties. Thirteen normal subjects pedaled a bicycle ergometer while positioned 30 degrees from the horizontal at 20, 40, 60 and 80 percent of the individual maximal aerobic power of each subject determined from a previous session. The results indicate that blood flow velocity in the arch of the aorta increases with increasing work load. Dissert Abstr

N79-25711*# General Electric Co Houston Tex
USER'S INSTRUCTIONS FOR THE ERYTHROPOIESIS REGULATORY MODEL

13 Mar 1978 42 p refs
 (Contract NAS9-15487)
 (NASA-CR-160193 TIR-741-LSP-8004) Avail NTIS
 HC A03/MF A01 CSCL 06P

The purpose of the model provides a method to analyze some of the events that could account for the decrease in red cell mass observed in crewmen returning from space missions. The model is based on the premise that erythrocyte production is governed by the balance between oxygen supply and demand at a renal sensing site. Oxygen supply is taken to be a function of arterial oxygen tension, mean corpuscular hemoglobin concentration, oxy-hemoglobin carrying capacity, hematocrit and blood flow. Erythrocyte destruction is based on the law of mass action. The instantaneous hematocrit value is derived by integrating changes in production and destruction rates and accounting for the degree of plasma dilution. G Y

N79-25712*# General Electric Co Houston Tex
STUDY REPORT ON A DOUBLE ISOTOPE METHOD OF CALCIUM ABSORPTION

10 Jul 1978 7 p refs
 (Contract NAS9-15487)
 (NASA-CR-160194 TIR-741-LSP-8009) Avail NTIS
 HC A02/MF A01 CSCL 06P

Some of the pros and cons of three methods to study gastrointestinal calcium absorption are briefly discussed. The methods are (1) a balance study, (2) a single isotope method, and (3) a double isotope method. A procedure for the double isotope method is also included. G Y

N79-25713*# General Electric Co Houston Tex
STRONTIUM METABOLISM IN THE REBUILDING OF SKELETAL TISSUE

10 Jul 1978 9 p refs
 (Contract NAS9-15487)
 (NASA-CR-160195 TIR-741-LSP-8010) Avail NTIS
 HC A02/MF A01 CSCL 06P

The relationship between calcium and strontium in bone metabolism is described. Whole body comparisons in the form of balance studies, plasma kinetics and biochemical bone differences are briefly reviewed. The value of strontium as a qualitative calcium mimetic is established. A procedure of strontium deposition in the bones is presented as a means to study postflight bone rebuilding and to locate areas of inflight demineralization. G Y

N79-25714*# General Electric Co Houston, Tex
THE INFLUENCE OF EXERCISE ON BONE ATROPHY

10 Jul 1978 5 p refs
 (Contract NAS9-15487)
 (NASA-CR-160196 TIR-741-LSP-8011) Avail NTIS
 HC A02/MF A01 CSCL 06P

The relationship between the skeletal system, the muscular system and exercise in bed rest studies are described. The regime of exercises performed, the mineral balance data derived, and the bone densitometric data obtained are discussed. A brief review of some of the histological results are also given. G Y

N79-25715*# General Electric Co Houston Tex
A BRIEF REVIEW OF SPACE FLIGHT CALCIUM METABOLISM RESULTS AND METHODOLOGIES

18 Jul 1978 24 p refs
 (Contract NAS9-15487)
 (NASA-CR-160198 TIR-741-LSP-8015) Avail NTIS
 HC A02/MF A01 CSCL 06P

Space flight induced osteoporosis was described. The techniques that were used to measure and detect the osteoporosis were also described. Areas of calcium metabolism were shown to be very important in the investigation into more sensitive detection and measurement techniques of bone demineralization. R E S

N79-25716*# General Electric Co Houston Tex
PRELIMINARY DESIGN SPECIFICATIONS OF A CALCIUM MODEL

6 Oct 1978 12 p refs
 (Contract NAS9-15487)
 (NASA-CR-160199 TIR-741-LSP-8022) Avail NTIS
 HC A2/MF A01 CSCL 06P

A list of objectives, requirements, and guidelines are given for a calcium model. Existing models are reviewed and evaluated in relation to the stated objectives and requirements. The reviewed models were either too abstract or apparently invalidated. A technical approach to the design of a desirable model is identified. G Y

N79-25717*# General Electric Co Houston Tex
DEVELOPMENT OF AN HYPOTHESIS FOR SIMULATING ANTI-ORTHOSTATIC BED REST

J I Leonard D J Grounds and D G Fitzjerrell 16 Oct 1978 51 p refs
 (Contract NAS9-15487)
 (NASA-CR-160200 TIR-741-LSP-8023) Avail NTIS
 HC A04/MF A01 CSCL 06S

The Guyton model modified by the addition of leg compartments and the effect of the gravity vector was used to evaluate hypotheses describing leg dehydration and fluid shifts. While the study is not complete, the basic approach was shown to be useful by identifying important mechanisms, identifying systems which need further experimental description and by assisting in the development of a general hypothesis. G Y

N79-25718*# Tennessee Univ Knoxville Dept of Biology
USE OF A COMPUTER MODEL IN THE UNDERSTANDING OF ERYTHROPOIETIC CONTROL MECHANISMS

C D R Dunn Oct 1978 38 p Prepared in cooperation with General Electric Co Houston
 (Contract NAS9-15487)
 (NASA-CR-160201 TIR-741-LSP-8029) Avail NTIS
 HC A03/MF A01 CSCL 06P

During an eight-week visit approximately 200 simulations using the computer model for the regulation of erythropoiesis were carried out in four general areas with the human model simulating hypoxia and dehydration, evaluation of the simulation of dehydration using the mouse model. The experiments led to two considerations for the models. Firstly, a direct relationship between erythropoietin concentration and bone marrow sensitivity to the hormone and secondly, a partial correction of tissue hypoxia prior to compensation by an increased hematocrit. This latter change in particular produced a better simulation of the effects of hypoxia on plasma erythropoietin concentrations. G Y

N79-25719*# General Electric Co Houston Tex
A PRIORITIZED SET OF PHYSIOLOGICAL MEASUREMENTS FOR FUTURE SPACEFLIGHT EXPERIMENTS

29 Nov 1978 12 p
 (Contract NAS9-15487)
 (NASA-CR-160202 TIR-741-LSP-8033) Avail NTIS
 HC A02/MF A01 CSCL 06P

A set of desired experimental measurements to be obtained in future spaceflights in four areas of physiological investigation are identified. The basis for identifying the measurements was the physiological systems analysis performed on Skylab data and related ground-based studies. An approach for prioritizing the

measurement list is identified and discussed with the use of examples. A prioritized measurement list is presented for each of the following areas: cardiopulmonary, fluid-renal, and electrolyte, hematology, and immunology, and musculoskeletal. Also included is a list of interacting stresses and other factors present in spaceflight experiments whose effects may need to be quantified. G Y

N79-25720*# General Electric Co Houston Tex
DYNAMIC REGULATION OF ERYTHROPOIESIS: A COMPUTER MODEL OF GENERAL APPLICABILITY

J I Leonard Jan 1979 51 p refs
 (Contract NAS9-15487)
 (NASA-CR-160203 TIR-741-LSP-9005) Avail NTIS
 HC A04/MF A01 CSCL 06P

A mathematical model for the control of erythropoiesis was developed based on the balance between oxygen supply and demand at a renal oxygen detector which controls erythropoietin release and red cell production. Feedback regulation of tissue oxygen tension is accomplished by adjustments of hemoglobin levels resulting from the output of a renal-bone marrow controller. Special consideration was given to the determinants of tissue oxygenation including evaluation of the influence of blood flow, capillary diffusivity, oxygen uptake, and oxygen-hemoglobin affinity. A theoretical analysis of the overall control system is presented. Computer simulations of altitude hypoxia, red cell infusion, hyperoxia, and homolytic anemia demonstrate validity of the model for general human application in health and disease. G Y

N79-25721*# General Electric Co Houston Tex
USER'S INSTRUCTIONS FOR THE CARDIOVASCULAR WALTERS MODEL

R C Croston 11 Jan 1973 15 p
 (Contract NAS9-12932)
 (NASA-CR-160204 TIR-741-MED-3006) Avail NTIS
 HC A02/MF A01 CSCL 06B

The model is a combined steady-state cardiovascular and thermal model. It was originally developed for interactive use but was converted to batch mode simulation for the Sigma 3 computer. The model has the purpose to compute steady-state circulatory and thermal variables in response to exercise work loads and environmental factors. During a computer simulation run, several selected variables are printed at each time step. End conditions are also printed at the completion of the run. G Y

N79-25722*# University of Southwestern Louisiana Lafayette
A SIMPLE MODEL OF FLUID FLOW AND ELECTROLYTE BALANCE IN THE BODY

Ronald J White and Larry Neal 24 Jan 1973 27 p refs
 Prepared for Gen Elec Co Houston Tex
 (Contract NAS9-12932)
 (NASA-CR-160205 TIR-741-MED-3010) Avail NTIS
 HC A03/MF A01 CSCL 06P

The model is basically a three-compartment model, the three compartments being the plasma, interstitial fluid, and cellular fluid. Sodium, potassium, chloride, and urea are the only major solutes considered explicitly. The control of body water and electrolyte distribution is affected via drinking and hormone levels. Basically, the model follows the effect of various oral input water loads on solute and water distribution throughout the body. G Y

N79-25723*# General Electric Co Houston Tex Apollo Systems Dept
FLUID AND ELECTROLYTE CONTROL SYSTEMS IN THE HUMAN BODY: A STUDY REPORT

Ronald J White 19 Jun 1973 13 p refs
 (Contract NAS9-12932)
 (NASA-CR-160210) Avail NTIS HC A02/MF A01 CSCL 06P

Research in the area of modeling of the fluid and electrolyte system is briefly reviewed and a model of this system, which is adequate for a basic description of the requisite physiological processes, is presented. The use of this model as an individual subsystem model and as a component of a more complete human model is discussed. Author

N79-25724*# General Electric Co. Houston Tex
USER'S INSTRUCTIONS FOR THE HIGH SPEED VERSION OF THE CARDIOVASCULAR EXERCISE MODEL
 R C Croston 16 Aug 1973 27 p
 (Contract NAS9-12932)
 (NASA-CR-160211 TIR-741-MED-3041) Avail NTIS
 HC A03/MF A01 CSCL 06B

A mathematical model and digital computer simulation of the human cardiovascular system and its controls were developed to simulate transient responses to bicycle ergometer exercise. The purpose of the model was to provide a method to analyze cardiovascular control hypotheses which cannot be easily tested in an animal or human or in a spaceflight environment. RES

N79-25725*# General Electric Co. Houston Tex
ON A BASIC MODEL OF CIRCULATORY, FLUID, AND ELECTROLYTE REGULATION IN THE HUMAN SYSTEM BASED UPON THE MODEL OF GUYTON
 Ronald J White 23 Aug 1973 196 p refs
 (Contract NAS9-12932)
 (NASA-CR-160212 TIR-741-MED-3042) Avail NTIS
 HC A09/MF A01 CSCL 06P

A detailed description of Guyton's model and modifications are provided. Also included are descriptions of several typical experiments which the model can simulate to illustrate the model's general utility. A discussion of the problems associated with the interfacing of the model to other models such as respiratory and thermal regulation models which is prime importance since these stimuli are not present in the current model is also included. A user's guide for the operation of the model on the Xerox Sigma 3 computer is provided and two programs are described. A verification plan and procedure for performing experiments is also presented. GY

N79-25726*# Kansas State Univ. Manhattan Dept of Electrical Engineering
INVESTIGATIONS OF RESPIRATORY CONTROL SYSTEMS SIMULATION
 R R Gallagher 7 Sep 1973 201 p refs Prepared for GE Co. Houston Tex
 (Contract NAS9-12932)
 (NASA-CR-160213 TIR-741-MED-3047) Avail NTIS
 HC A10/MF A01 CSCL 06P

The Grodins respiratory control model was investigated and it was determined that the following modifications were necessary before the model would be adaptable for current research efforts: (1) the controller equation must be modified to allow for integration of the respiratory system model with other physiological systems; (2) the system must be more closely correlated to the salient physiological functionings; (3) the respiratory frequency and the heart rate should be expanded to illustrate other physiological relationships and dependencies; and (4) the model should be adapted to particular individuals through a better defined set of initial parameter values in addition to relating these parameter values to the desired environmental conditions. Several of Milhorn's respiratory control models were also investigated in hopes of using some of their features as modifications for Grodins' model. RES

N79-25727*# General Electric Co. Houston Tex Space Div
STUDY REPORT ON MODIFICATION OF THE LONG TERM CIRCULATORY MODEL FOR THE SIMULATION OF BED REST
 J I Leonard and D J Grounds 15 Jul 1977 114 p refs
 (Contract NAS9-14523)
 (NASA-CR-160186 TIR-782-LSP-7011) Avail NTIS
 HC A06/MF A01 CSCL 06S

Modifications were made of the circulatory fluid and electrolyte control model which was based on the model of Guyton. The modifications included separate leg compartments and the addition of gravity dependency. It was found that these modifications allowed for more accurate bed rest simulation by simulating changes in the orthostatic gradient and simulating the response to the fluid shifts associated with bed rest. RES

N79-25728*# General Electric Co. Houston, Tex
IMPROVEMENTS AND VALIDATION OF THE ERYTHROPOIESIS CONTROL MODEL FOR BED REST SIMULATION
 J I Leonard 29 Jul 1977 90 p refs
 (Contract NAS9-14523)
 (NASA-CR-160187 TIR-782-LSP-7012) Avail NTIS
 HC A05/MF A01 CSCL 06S

The most significant improvement in the model is the explicit formulation of separate elements representing erythropoietin production and red cell production. Other modifications include bone marrow time-delays capability to shift oxyhemoglobin affinity and an algorithm for entering experimental data as time-varying driving functions. An area of model development is suggested by applying the model to simulating onset, diagnosis and treatment of a hematologic disorder. Recommendations for further improvements in the model and suggestions for experimental application are also discussed. A detailed analysis of the hematologic response to bed rest including simulation of the recent Baylor Medical College bed rest studies is also presented. GY

N79-25729*# General Electric Co. Houston Tex
STUDY REPORT ON INTERFACING MAJOR PHYSIOLOGICAL SUBSYSTEM MODELS AN APPROACH FOR DEVELOPING A WHOLE-BODY ALGORITHM
 D G Fitzjerrell D J Grounds and J I Leonard 20 Jun 1975 113 p refs
 (Contract NAS9-12932)
 (NASA-CR-160232 TIR-741-MED-5008) Avail NTIS
 HC A06/MF A01 CSCL 06P

Using a whole body algorithm simulation model a wide variety and large number of stresses as well as different stress levels were simulated including environmental disturbances, metabolic changes and special experimental situations. Simulation of short term stresses resulted in simultaneous and integrated responses from the cardiovascular, respiratory and thermoregulatory subsystems and the accuracy of a large number of responding variables was verified. The capability of simulating significantly longer responses was demonstrated by validating a four week bed rest study. In this case the long term subsystem model was found to reproduce many experimentally observed changes in circulatory dynamics, body fluid-electrolyte regulation and renal function. The value of systems analysis and the selected design approach for developing a whole body algorithm was demonstrated. RES

N79-25730*# General Electric Co. Houston Tex
THE DEVELOPMENT OF A WHOLE-BODY ALGORITHM
 Franklin J Kay 15 Nov 1973 120 p refs
 (Contract NAS9-12932)
 (NASA-CR-160214 TIR-741-MED-3058) Avail NTIS
 HC A06/MF A01 CSCL 06P

The whole-body algorithm is envisioned as a mathematical model that utilizes human physiology to simulate the behavior of vital body systems. The objective of this model is to determine the response of selected body parameters within these systems to various input perturbations or stresses. Perturbations of interest are exercise, chemical imbalances, gravitational changes and other abnormal environmental conditions. This model provides for a study of man's physiological response in various space applications, underwater applications, normal and abnormal workloads and environments, and the functioning of the system with physical impairments or decay of functioning components. Many methods or approaches to the development of a whole-body algorithm are considered. Of foremost concern is the determination of the subsystems to be included, the detail of the subsystems and the interaction between the subsystems. GY

N79-25731*# General Electric Co. Houston Tex
USER'S INSTRUCTIONS FOR THE GUYTON CIRCULATORY DYNAMICS MODEL USING THE UNIVAC 1110 BATCH AND DEMAND PROCESSING (WITH GRAPHIC CAPABILITIES)
 G T Archer 28 Feb 1974 96 p refs
 (Contract NAS9-12932)
 (NASA-CR-160215 TIR-741-MED-4004) Avail NTIS
 HC A05/MF A01 CSCL 06P

The model presents a systems analysis of a human circulatory regulation based almost entirely on experimental data and cumulative present knowledge of the many facets of the circulatory system. The model itself consists of eighteen different major systems that enter into circulatory control. These systems are grouped into sixteen distinct subprograms that are melded together to form the total model. The model develops circulatory and fluid regulation in a simultaneous manner. Thus the effects of hormonal and autonomic control, electrolyte regulation and excretory dynamics are all important and are all included in the model. G Y

N79-25732*# General Electric Co. Houston Tex
USER'S INSTRUCTIONS FOR THE GE CARDIOVASCULAR MODEL TO SIMULATE LBNP AND TILT EXPERIMENTS, WITH GRAPHIC CAPABILITIES

29 Mar 1974 33 p
 (Contract NAS9-12932)
 (NASA-CR-160216 TR-741-MED-4008) Avail NTIS
 HC A03/MF A01 CSCL 06P

The present form of this cardiovascular model simulates both 1-g and zero-g LBNP (lower body negative pressure) experiments and tilt experiments. In addition the model simulates LBNP experiments at any body angle. The model is currently accessible on the Univac 1110 Time-Shared System in an interactive operational mode. Model output may be in tabular form and/or graphic form. The graphic capabilities are programmed for the Tektronix 4010 graphics terminal and the Univac 1110. Author

N79-25733*# General Electric Co. Houston Tex
EVALUATION OF EXERCISE-RESPIRATORY SYSTEM MODIFICATIONS AND INTEGRATION SCHEMES FOR PHYSIOLOGICAL SYSTEMS

R R Gallagher (Kansas State Univ.) 16 Jul 1974 92 p refs
 (Contract NAS9-12932)
 (NASA-CR-160223 TIR-741-MED-4018) Avail NTIS
 HC A05/MF A01 CSCL 06P

Exercise subroutine modifications are implemented in an exercise-respiratory system model yielding improvement of system response to exercise forcings. A more physiologically desirable respiratory ventilation rate in addition to an improved regulation of arterial gas tensions and cerebral blood flow is observed. A respiratory frequency expression is proposed which would be appropriate as an interfacing element of the respiratory-pulsatile cardiovascular system. Presentation of a circulatory-respiratory system integration scheme along with its computer program listing is given. The integrated system responds to exercise stimulation for both nonstressed and stressed physiological states. Other integration possibilities are discussed with respect to the respiratory pulsatile cardiovascular thermoregulatory and the long-term circulatory systems. Author

N79-25734*# General Electric Co. Houston Tex
STUDY REPORT ON GUIDELINES AND TEST PROCEDURES FOR INVESTIGATING STABILITY OF NONLINEAR CARDIOVASCULAR CONTROL SYSTEM MODELS

D G Fitzjerrell 11 Nov 1974 17 p refs
 (Contract NAS9-12932)
 (NASA-CR-160229 TIR-741-MED-4029) Avail NTIS
 HC A01/MF A01 CSCL 06P

A general study of the stability of nonlinear as compared to linear control systems is presented. The analysis is general and therefore applies to other types of nonlinear biological control systems as well as the cardiovascular control system models. Both inherent and numerical stability are discussed for corresponding analytical and graphic methods and numerical methods. G Y

N79-25735*# General Electric Co. Houston Tex
USER'S INSTRUCTIONS FOR THE WHOLE-BODY ALGORITHMS

D J Grounds, D G Fitzjerrell, J I Leonard and V J Marks
 24 Jun 1975 134 p
 (Contract NAS9-12932)
 (NASA-CR-160233 TIR-741-MED-5009) Avail NTIS
 HC A07/MF A01 CSCL 06P

The design of an algorithm that provides for the simulation of long and short term biological stresses is reported. The physiological responses of models representing circulatory, respiratory, cardiovascular and thermoregulatory systems during space flight simulation are described. M M M

N79-25736*# Pennsylvania State Univ. University Park Dept of Biochemistry and Biophysics

PURIFICATION AND CULTIVATION OF HUMAN PITUITARY GROWTH HORMONE SECRETING CELLS. Annual Report

W C Hyner 31 May 1979 28 p
 (Contract NAS9-15566)
 (NASA-CR-160242) Avail NTIS HC A03/MF A01 CSCL 06A

Efforts were directed towards maintenance of actively secreting human pituitary growth hormone cells (somatotrophs) in vitro. The production of human growth hormone (hGH) by this means would be of benefit for the treatment of certain human hypopituitary diseases such as dwarfism. One of the primary approaches was the testing of agents which may logically be expected to increase hGH release. The progress towards this goal is summarized. Results from preliminary experiments dealing with electrophoresis of pituitary cell for the purpose of somatotroph separation are described. G Y

N79-25737*# National Aeronautics and Space Administration Pasadena Office Calif

MULTIFUNCTIONAL TRANSDUCER Patent Application

Cyril Feldstein (JPL), Gilbert W Lewis (JPL), Virgil H Culler (JPL) and Samuel Meerbaum inventors (to NASA) (JPL) Filed 1 Jun 1979 13 p

(Contract NAS7-100)
 (NASA-Case-NPO-14329-1 US-Patent-Appl-SN-044432) Avail NTIS HC A02/MF A01 CSCL 06B

A transducer is described for simultaneously measuring several parameters of a small region of a muscle tissue or other object with minimal traumatizing or damage of the object. A trifunctional transducer which can measure the force applied by a muscle fiber, the displacement of the fiber and the change in thickness of the fiber includes a device having three legs with the inner ends joined together and outer ends formed to pierce the tissue and lie therein. Two legs are relatively stiff to measure force applied by the tissue and a third leg is relatively flexible to measure displacement of the tissue relative to one or both stiff legs and with the three legs lying in a common plane so that the force and displacement measurements all relate to the same direction of muscle movement. NASA

N79-25738*# General Electric Co. Houston Tex
MODIFICATIONS TO THE STEADY-STATE 41-NODE THERMOREGULATORY MODEL INCLUDING VALIDATION OF THE RESPIRATORY AND DIFFUSIONAL WATER LOSS EQUATIONS

17 Jul 1974 34 p refs
 (Contract NAS9-12932)
 (NASA-CR-160219 TIR-741-MED-4014) Avail NTIS
 HC A03/MF A01 CSCL 06P

After the simplified version of the 41-Node Stolwijk Metabolic Man Model was implemented on the Sigma 3 and UNIVAC 1110 computers in batch mode it became desirable to make certain revisions. First the availability of time-sharing terminals makes it possible to provide the capability and flexibility of conversational interaction between user and model. Secondly, recent physiological studies show the need to revise certain parameter values contained in the model. Thirdly it was desired to make quantitative and accurate predictions of evaporative water loss for humans in an orbiting space station. The result of the first phase of this effort are reported. G Y

N79-25739*# General Electric Co. Houston Tex
THE APPLICATION OF SYSTEMS ANALYSIS AND MATHEMATICAL MODELS TO THE STUDY OF ERYTHROPOIESIS DURING SPACE FLIGHT

J I Leonard 15 Jul 1974 34 p refs
 (Contract NAS9-12932)
 (NASA-CR-160218) Avail NTIS HC A03/MF A01 CSCL 06P

Included in the report are (1) review of the erythropoietic mechanisms (2) an evaluation of existing models for the control of erythropoiesis (3) a computer simulation of the model's response to hypoxia, (4) an hypothesis to explain observed decreases in red blood cell mass during weightlessness, (5) suggestions for further research and (6) an assessment of the role that systems analysis can play in the Skylab hematological program
G Y

N79-25740* General Electric Co Houston Tex Apollo Systems Dept

USER'S GUIDE FOR THE SKYLAB INTEGRATED MEDICAL DATA ANALYSIS SYSTEM

D J Grounds G T Archer and V J Marks 5 Dec 1975 96 p refs

(Contract NAS9-14523)

(NASA-CR-160189) Avail NTIS HC A05/MF A01 CSCL 06P

Capabilities of the Skylab Integrated Medical Data Analysis System (SIMDAS) are described and illustrated. User's instructions are also given for the operation of this system on the UNIVAC 1100 Series Demand System at the Johnson Space Center
Author

**N79-25741# Desmatics, Inc. State College Pa
SOME BAYESIAN INFERENCE PROCEDURES FOR USE IN DEVELOPING AN IMPACT ACCELERATION INJURY PREDICTION MODEL**

John J Peterson and Dennis E Smith Mar 1979 20 p refs (Contract N00014-74-C-0154, NR Proj 207-037)

(AD-A067228 TR-102-8) Avail NTIS HC A02/MF A01 CSCL 12/1

Research on the development of an impact acceleration injury prediction model based primarily on information in the data has been discussed in previous technical reports. This technical report describes Bayesian inference procedures which permit the experimenter to combine his or her prior beliefs and expert knowledge with the data observed in the experiment
Author (GRA)

**N79-25742# California Univ Irvine
ACUTE TOXICITY OF A NUMBER OF CHEMICALS OF INTEREST TO THE AIR FORCE**

C L Gaworski E R Kinkead and R L Doyle Mar 1979 32 p refs

(Contract F33615-76-C-5005 AF Proj 6302)

(AD-A067313 AMRL-TR-79-11)

Avail NTIS HC A03/MF A01 CSCL 06/20

A series of 20 chemical compounds used by the Air Force were evaluated for acute toxicity effects to establish safe handling guidelines. Skin sensitization potential irritation effects and LD(50) doses were determined for most of these materials. Of the compounds tested, nonyl phenol caused a skin sensitization reaction in 18 of 20 animals dosed and 14-dihydroxyanthraquinone which did not sensitize many animals produced a very severe reaction in those affected. Author (GRA)

**N79-25743# Army Research Inst of Environmental Medicine
Natick Mass**

EVIDENCE FOR INCREASED INTRATHORACIC FLUID VOLUME IN MAN AT HIGH ALTITUDE

James J Jaeger J T Sylvester A Cymerman J T Mather and J J Berberich 13 Sep 1978 27 p

(DA Proj 3E7-62777-A-845)

(AD-A065333 USARIEM-M-72/78)

Avail NTIS HC A03/MF A01 CSCL 06/5

To determine if subclinical pulmonary edema occurs commonly at high altitude, 25 young male soldiers participated in a strenuous 72 h field exercise at low altitude (200 to 875 m) and in a similar exercise one week later at high altitude (3000 to 4300 m). At 0, 36, and 72 h of each phase the subjects were given a physical examination, a chest radiograph was taken and the following measurements were made: total lung capacity, forced vital capacity, residual volume, closing capacity, slope of phase III of the nitrogen washout curve, transthoracic electrical

impedance and the quasi-static relationship between transpulmonary pressure and lung volume (PV curve)
GRA

**N79-25744# Army Research Inst of Environmental Medicine
Natick Mass**

PHYSIOLOGICAL EFFECTS OF A MILITARY TRAINING PROGRAM ON MALES AND FEMALES

William L Daniels Dennis M Kowal, James A Vogel and Robert M Stauffer 28 Jun 1978 18 p refs

(AD-A062936 USARIEM-M-40/78)

Avail NTIS HC A02/MF A01 CSCL 05/9

The purpose of this study was to determine the effect of a military training program on the aerobic power of young active males and females. Twenty-nine males and twenty-six females (17-21 yrs old) were evaluated at the beginning and the end of the six week training which all incoming freshmen (plebes) undergo upon entering the U S Military Academy. The aerobic portion of the training consisted of running for 30 minutes 5-6 days/week. Subjects ran at varied speeds depending upon their performance in an initial 1.5 mile run test.
GRA

**N79-25745# Army Research Inst of Environmental Medicine
Natick Mass**

THE EFFECTS OF DEHYDRATION ON PERIPHERAL COOLING

J J Berberich Donald E Roberts and R E Roeger 18 Jul 1978 32 p

(AD-A065332 USARIEM-M-2/79)

Avail NTIS HC A03/MF A01 CSCL 06/16

Ten men were dehydrated by voluntary restriction of fluid intake and by mild exercise over a 2 1/2 day period (body weight loss 4.6%). Body weight returned to -1.6% and -0.3% of their starting weight 10 and 20 hours after rehydration respectively, suggesting the weight loss was fluid loss. Measures of blood and urine constituents also were supportive of dehydration. These 10 experimental subjects experienced a standard cold test prior to and after dehydration and after rehydration. The standard cold test consisted of sitting in a cold chamber (0 C) dressed in cold weather clothing with right hand bare for 2 hours. The fingers but not the back of the hand of the experimentals were significantly (18%) colder following dehydration and were slightly warmer following initial rehydration. A group of 10 control subjects tested under identical conditions but hydrated at all times showed no changes.
Author (GRA)

**N79-25746# Cincinnati Univ Ohio Orthopaedic Biomechanics
Lab**

KNEE FLAIL DESIGN LIMITS BACKGROUND, EXPERIMENTATION AND DESIGN CRITERIA Final Report, 1 Mar 1976 - 15 Jul 1978

Edward Grood Frank Noyes and David Butler Oct 1978 64 p refs

(Contract F33615-76-C-0511)

(AD-A062384 AMRL-TR-78-58)

Avail NTIS HC A04/MF A01 CSCL 06/5

A major problem experienced during ejection of crewmembers from disabled aircraft is flailing injury to the knee caused by the large aerodynamic forces. The majority of injuries that occur are tears of the collagenous tissues, ligaments and capsular structures which hold the tibia and femur together at the knee. The design of protective systems capable of preventing these injuries requires knowledge of the mechanical properties of knee ligaments and the factors which can effect the experimental results. This report combines new experimental data on the tensile strength of human anterior cruciate ligaments and torsional strength of the intact human knee with data on the strength of Rhesus monkey knee ligaments. The information is organized and presented so as to provide a background for relating mechanical property studies of ligaments and tendons to the establishment of design criteria for protective systems. In the last two chapters the torsional strength data obtained under the current contract are presented and design criteria for the prevention of torsional injuries are developed. The effects of age and species on the tensile strength of the anterior cruciate ligament which were determined in the current contract are presented in greater detail in a separate Air Force technical report.
Author (GRA)

N79-25747# Boeing Co Seattle Wash
THE EFFECTS OF PILOT AGE, LIGHTING, AND HEAD-DOWN TIME ON VISUAL ACCOMMODATION
 C Larry and C Elsworth Feb 1979 71 p refs
 (AD-A064912 D162-10378-1-TN) Avail NTIS
 HC A04/MF A01 CSCL 06/16

The study discussed in this report is exploratory. It was undertaken to (1) determine the effects which age lighting and the duration of near vision tasks have on visual accommodation and (2) obtain vision data which could be applied to improve aircrew utilization and crew station design. The results indicated that the ability to focus the eyes at infinity following the performance of near vision tasks decreases with age and eye focusing time is related to the duration of the near vision task and with some exceptions increases with increase in near vision task time. Further study utilizing larger sample sizes is required to verify these preliminary conclusions and expand their usefulness to crew station designers. Author (GRA)

N79-25748# Army Aeromedical Research Lab Fort Rucker Ala

A PORCINE BIOASSAY STUDY OF THE PHYSIOLOGICAL EFFECTS OF FIBER AND DYE DEGRADATION PRODUCTS (FDP) ON BURN WOUND HEALING Final Report

Francis S Knox III Thomas L Wachtel George R McCahan, Jr and Stanley C Knapp Jun 1978 30 p refs
 (DA Proj 3E7-62173-A-819)
 (AD-A066990 USAARL-78-10) Avail NTIS
 HC A03/MF A01 CSCL 06/19

Visible components of fiber and dye degradation products were deposited on the surface of burned skin. A single layer of fabric with a 6.35 mm air gap between it and the skin deposited the greatest amount of FDP. The presence of an intervening cotton T-shirt decreased the amount of FDP deposited on the skin. We found no evidence that the FDP caused alterations in wound healing. Author (GRA)

N79-25749# Wayne State Univ Detroit Mich Bioengineering Center

TOLERANCE OF THE NECK TO INDIRECT IMPACT

Albert I King Said S Nakhla and Naveen K Mital 5 Mar 1979 16 p refs Submitted for publication
 (Contract N00014-75-C-1015)
 (AD-A066971 TR-10) Avail NTIS HC A02/MF A01 CSCL 12/1

A two-dimensional mathematical model of the spine was exercised to identify mechanisms of neck injury due to hyperflexion. Loss of pilots due to ditching at sea was one of the motivations for this study. It was found that helmets have the potential of increasing injury severity particularly during a combined -Gz and -Gx impact with the pulses coincident in time. The four parameters that are potentially injurious are neck shear chin-chest contact force odontoid process excursion into the spinal canal and spinal cord stretch. Author (GRA)

N79-25750# Office of Radiation Programs Las Vegas Nev Electromagnetic Radiation Analysis Branch

MEASUREMENTS OF RADIOFREQUENCY FIELD INTENSITY IN BUILDINGS WITH CLOSE PROXIMITY TO BROADCAST STATIONS

Richard A Tell and Norbert N Hankin Aug 1978 47 p refs
 (PB-290944/8 ORP/EAD-78/3) Avail NTIS
 HC A03/MF A01 CSCL 06R

The results of a series of radiofrequency field intensity measurements made in eight tall buildings located in New York Miami Chicago San Diego and Houston are summarized. The buildings in which the measurements were made were selected because of their proximity to FM radio and/or VHF and UHF television transmitting antennas. These broadcast antennas were usually located on nearby buildings so that the possibility existed for high intensity illumination of the upper floors of the buildings selected by the main beam of radiation of the antennas. The principal objective in conducting these measurements was to obtain information about the field intensities which can be produced by broadcast antennas at locations close to the antennas and near the main beam axis. In addition the measurements help in determining the higher level radiofrequency exposures of

persons who work and live in tall buildings under similar irradiation situations. GRA

N79-25751# Civil Aeromedical Inst Oklahoma City Okla
A COMPARISON OF THREE MODELS FOR DETERMINING TEST FAIRNESS

Mary A Lewis Nov 1978 16 p refs
 (AD-A066586 FAA-AM-79-3) Avail NTIS HC A02/MF A01 CSCL 05/10

In addressing the issue of test fairness the sample size of the minority group is usually very small. Thus sampling error alone could cause a test to appear unfair to either group when in fact both groups were sampled from populations with identical test and criterion characteristics. There are three prominent models of test fairness in the dichotomous situation: (1) Thorndike's Constant Ratio model, (2) Darlington's Conditional Probability model, and (3) Einhorn and Bass's Equal Probability model. Using a Monte Carlo technique the robustness of these models to divergent sample size were explored. The models were compared for their robustness to sample size differences, different predictor/criterion correlations, and different selection and success ratios. Results indicate that all three models are equally able to identify test fairness under the conditions specified in the study. G Y

N79-25752# Civil Aeromedical Inst Oklahoma City Okla
THE DEVELOPMENT OF THE ATC SELECTION BATTERY: A NEW PROCEDURE TO MAKE MAXIMUM USE OF AVAILABLE INFORMATION WHEN CORRECTING CORRELATIONS FOR RESTRICTION IN RANGE DUE TO SELECTION

James O Boone and Mary A Lewis Sep 1978 46 p refs
 (FAA-AM-78-36) Avail NTIS HC A03/MF A01

A five-test selection battery is currently given to select air traffic controllers. Data were collected on two tests being considered for incorporation into the battery. To determine the utility of the old and new tests, it is necessary to correlate the tests with a criterion of job success. However, since criterion information is available only on persons already selected for air traffic control work, the correlation is restricted to this upper range of persons and is thereby spuriously low for prediction purposes. To properly evaluate the utility of the tests, the correlation must be corrected for this restriction in range. A procedure to more accurately correct correlations for restriction in range is described. G Y

N79-25753*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio

OVERALL LOUDNESS OF STEADY SOUNDS ACCORDING TO THEORY AND EXPERIMENT

Walton L Howes Oct 1979 150 p refs
 (NASA-RP-1001 E-8342) Avail NTIS MF A01 HC SOD CSCL 05J

A mathematical theory for calculating the loudness of any steady sound from information on its spectrum is constructed from physical principles and psychological and physiological information on mammalian auditory systems. The theory involves filtering, channeling, squaring, half-wave rectification, and time average of the signal. The theory accounts for critical bands for loudness, audibility of sounds consisting of subliminal components, audible beats, periodicity, pitch, and pitch of the residue. These and other psychoacoustic phenomena are explained in terms of electrical activity in the peripheral nervous system. Simple approximations for loudness are derived from the more exact formulas. Loudness predictions are compared with a wide variety of published loudness judgement data with considerable success. Author

N79-25754# Catholic Univ of America Washington, D C Dept of Psychology

TWO APPROACHES TO CATEGORY REPRESENTATION IN AURAL CLASSIFICATION

James A Ballas and James H Howard, Jr Dec 1978 24 p refs
 (Contract N00014-75-C-0308)
 (AD-A066705 TR-78-9-ONR) Avail NTIS HC A02/MF A01 CSCL 06/16

The classification model proposed by Howard Ballas and Burgy (1978) assumes that each category in a classification task is represented by an abstract prototype. Neumann (1977) argues that the evidence for prototype representations can be explained by the indeterminacy of exemplar attributes. A test of these two models would require that attribute indeterminacy be measured. In a classification task attribute indeterminacy can lead to overlapping category boundaries. In turn, this results in confusions which can then be a measure of indeterminacy. An aural classification experiment was conducted where listeners classified sixteen amplitude-modulated noise patterns into one of four four-exemplar categories. Results of a post training recognition test indicated that an unexperienced prototype was rated as familiar but this effect was reduced with increased practice with the category exemplars. Neither the prototype nor Neumann's model was supported unequivocally. Classification results did demonstrate that the classification model is applicable to four exemplar categories defined in two dimensions. Author (GRA)

N79-25756# Catholic Univ of America Washington, D C Human Performance Lab

PREDICTING INDIVIDUAL LISTENER CONFUSIONS IN THE CLASSIFICATION OF COMPLEX, STEADY-STATE SOUNDS

James A Ballas and James H Howard Jr Dec 1978 24 p refs

(Contract N00014-75-C-0308)

(AD-A066704 TR-78-8-ONR) Avail NTIS HC A02/MF A01 CSCL 06/6

Research was conducted using amplitude modulated noise with modulation frequency and waveform attack as relevant dimensions. Subjects were required to classify sixteen sounds into eight categories emphasizing one of the dimensions for eight blocks and then the other dimension for eight blocks. Capacity was estimated by the model and was equivalent for both classification tasks for individual subjects. Allocation of capacity reflected dimensional relevance. M M M

N79-25756# Catholic Univ of America Washington D C Dept of Psychology

CLASSIFICATION OF AMPLITUDE-MODULATED NOISE PATTERNS WITH EXTENDED PRACTICE

James H Howard Jr and James A Ballas Dec 1978 23 p refs

(Contract N00014-75-C-0308)

(AD-A066703 TR-78-7-ONR) Avail NTIS HC A02/MF A01 CSCL 06/16

Four listeners were given extended practice in an eight-category classification task (3072 trials). The stimuli were sixteen amplitude-modulated noise patterns that varied in modulation frequency (Tempo) and attack (Quality). Two listeners learned an eight-category partition that was based primarily on stimulus Quality and two learned a partition that was based primarily on stimulus Tempo. The resulting confusion data were analyzed in terms of the aural classification model proposed by Howard, Ballas, and Burgy (1978). The theoretical analysis enabled us to specify the relative emphasis placed on the two stimulus features by each listener on each of the sixteen trial blocks. The results indicated that although large individual differences occurred all listeners had more difficulty making use of the subtle stimulus differences along the Quality dimension than they did of differences along the Tempo dimension. GRA

N79-25757# Arizona State Univ Tempe **STRESS AND SIMULATION IN PILOT TRAINING Final Report, May - Dec 1977**

Gary S Krahenbull Feb 1979 26 p refs

(Contract F41609-75-C-0028)

(AD-A066670 AFHRL-TR-78-95) Avail NTIS HC A03/MF A01 CSCL 05/9

Catecholamine excretion for 20 USAF student pilots and 13 instructor pilots was determined during daily activities during sorties performed in high realism simulators and during actual flight. High realism simulation resulted in a measurable stress response in both students and instructors. The response was

not related to previous flight experience. One group of students (experimental n-10) experienced power-on stalls and spin recoveries in the simulator prior to their introduction in the aircraft. A second group of students (control n-10) experienced power-on stalls and spin recoveries in the aircraft prior to their introduction in the simulator. Catecholamine excretion during simulation was not different for the two groups. Thus aircraft exposure to the spin series did not alter the stress response of the students attempting a similar maneuver in a high realism simulator. Catecholamine excretion during the aircraft spin was also similar for the experimental and control groups. Thus task-specific high realism simulation introduced prior to exposure to related stressful in-flight tasks results in similar total stress response but somewhat lower arousal and greater mental activity. A comparison of superior and inferior students within each group suggested that the simulator pretraining had the greatest effect on the inferior students. A comparison of student and instructor catecholamine excretion from the aircraft power-on stall and spin recovery lesson unit showed a lack of significant relationship. GRA

N79-25758# National Technical Information Service Springfield Va

FLIGHT SIMULATOR TRAINING, VOLUME 2 A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1974 - Feb 1979

Guy E Habercom Jr Apr 1979 229 p Supersedes NTIS/PS-78/0128, NTIS/PS-77/0146 NTIS/PS-76/0068

(NTIS/PS-79/0277/8 NTIS/PS-78/0128 NTIS/PS-77/0146, NTIS/PS-76/0068) Avail NTIS HC \$28.00/MF \$28.00 CSCL 05/1

Volume two continues the materials begun in Volume one. Documentation is presented of methodology and equipment used in the training of airmen principally military involving flight simulation and simulators. Subjects of discussion include maneuvering, visual fields, visual perception, flight control, guidance approach landings, VTOL and STOL craft, helicopters, pilot characteristics, performance standards, space flight and aircraft dynamics. Also covered are training concepts, physiological characteristics and psychological aspects. References on the training simulators themselves, but not on their use are excluded. GRA

N79-25759*# General Electric Co Houston Tex **THE APPLICATION OF MINIQASI TO THERMAL PROGRAM BOUNDARY AND INITIAL VALUE PROBLEMS**

7 Oct 1974 8 p refs

(Contract NAS9-12932)

(NASA-CR-160227 TIR-741-MED-4026) Avail NTIS HC A02/MF A01 CSCL 06P

The feasibility of applying the solution techniques of Miniquasi to the set of equations which govern a thermoregulatory model is investigated. For solving nonlinear equations and/or boundary conditions, a Taylor Series expansion is required for linearization of both equations and boundary conditions. The solutions are iterative and in each iteration a problem like the linear case is solved. It is shown that Miniquasi cannot be applied to the thermoregulatory model as originally planned. G Y

N79-25760*# Hamilton Standard Windsor Locks Conn **FLIGHT PROTOTYPE CO2 AND HUMIDITY CONTROL SYSTEM Final Report**

Karen M Rudy May 1979 79 p

(Contract NAS9-13624)

(NASA-CR-160224, SVHSER-7208-Add) Avail NTIS HC A05/MF A01 CSCL 06K

A regenerable CO2 and humidity control system is presently being developed for potential use on shuttle as an alternative to the baseline lithium hydroxide system. The system utilizes a sorbent material (designated HS-C) to adsorb CO2 and the latent heat load from the cabin atmosphere and desorb the CO2 and water vapor overboard when exposed to a space vacuum thus reducing the overall vehicle heat rejection load. Continuous operation is achieved by utilizing two beds which are alternatively cycled between adsorption and desorption. The

HS-C material process was verified. Design concepts for the auxiliary components for the HS-C prototype system were generated. Performance testing verified system effectiveness in controlling CO2 partial pressure and humidity. Author

N79-25761# National Aeronautics and Space Administration Langley Research Center Hampton Va

HELMET WEIGHT SIMULATOR Patent Application

Billy R Ashworth Alton C Hall, and Clyde E Clark inventors (to NASA) Filed 30 May 1979 9 p (NASA-Case-LAR-12320-1, US-Patent-Appl-SN-043913) Avail NTIS HC A02/MF A01 CSCL 01D

A device for providing acceleration cues to the helmet of a simulator pilot is presented. Pulleys are attached to both shoulders of the pilot. A cable is attached to both sides of the helmet and extends through the pulleys to a takeup reel that is controlled by a torque motor. Control signals are applied to a servo system including the torque motor, the takeup reel and a force transducer which supplies the feedback signal. In one embodiment of the invention the force transducer is in the cable and in another it is in the takeup reel. NASA

N79-25762# Army Aeromedical Research Lab Fort Rucker Ala

EVALUATION OF FOUR THERMALLY PROTECTIVE FABRICS USING THE USAARL BIOASSAY METHOD Final Report

Francis S Knox III Thomas L Wachtel and George R McCahan Jr Jun 1978 36 p refs Presented at the 10th Sci and Session of the Joint Comm on Aviation Pathol Halton Engl Sep 1976

(DA Proj 3E7-62773-A-819)

(AD-A067351 USAARL-78-9) Avail NTIS HC A03/MF A01 CSCL 11/5

The United States Army Aeromedical Research Laboratory (USAARL) porcine cutaneous bioassay technique was used to determine what mitigating effect four thermally protective flight suit fabrics would have on fire-induced skin damage. The fabrics were 4.8 oz twill weave Nomex aramide, 4.5 oz stabilized twill weave polybenzimidazole, a 4.8 oz plain weave experimental high temperature polymer, and 4.8 oz plain weave Nomex aramide. Each fabric sample was assayed 20 times in each of four configurations: as a single layer in contact with the skin; as a single layer with a 6.35 mm (one-fourth inch) air gap between fabric and skin; in conjunction with a cotton T-shirt with no air gaps; and, finally, in conjunction with a T-shirt with 6.35 mm air gap between T-shirt and fabric. Bare skin was used as a control. A JP-4 fueled furnace was used as a thermal source and was adjusted to deliver a mean heat flux of 3.07 sq cm/sec. The duration of exposure was five seconds. Four hundred burn sites were graded using clinical observation and microscopic technique. GRA

N79-25763# Air Force Flight Dynamics Lab, Wright-Patterson AFB Ohio School of Engineering

AN ADAPTIVE CONTROLLER WHICH DISPLAYS HUMAN OPERATOR LIMITATIONS FOR A FIGHTER TYPE AIRCRAFT Ph D Thesis

Eric K Lindberg Nov 1978 306 p refs

(AD-A066193, AFIT/DS/EE/78-1)

Avail NTIS

HC A14/MF A01 CSCL 01/3

A general adaptive controller which displays human operation limitations is developed for a fighter type aircraft flying a dynamic trajectory by using the total airframe-control system perturbation equations. The adaptive controller is implemented using a forced separation controller with limitations. The major limitations are that it cannot actively control or observe more than one channel at a time and that there is a time delay in information processing. A decision process is necessary to choose the current channel in real-time because of the limited attention and control assumed for the controller. This attention has two effects: specification of an observation matrix, and specification of a control matrix. This specification is made using a Bayesian decision process from a choice of possible observations and controls, each choice emphasizing different aircraft states. The mathematical

outcome is an adaptive forced separation controller which is flexible enough that it can be implemented on any aircraft control problem as long as the trajectory can be specified. Analysis and synthesis techniques for the time varying aircraft model dynamics are demonstrated. The outcome is the evolution of a method for analyzing total aircraft/controller response to perturbations on a general trajectory. GRA

N79-25764# Navy Clothing and Textile Research Facility Natick Mass

ALUMINIZED FIREFIGHTERS' CRASH-RESCUE PROTECTIVE HOOD FACEPIECE-VISOR REDESIGN STUDY Final Report, Oct 1976 - Sep 1977

Francis S Andruk Dec 1978 16 p refs

(AD-A066492 NCTRF-134 CEEDO-TR-78-04) Avail NTIS HC A02/MF A01 CSCL 06/17

The Navy Clothing and Textile Research Facility (NCTRF) conducted a redesign study for the purpose of improving the standard aluminized firefighters' crash-rescue hood. Efforts were directed towards developing an adjustable facepiece visor assembly which would permit unrestricted visibility, verbal communication and the exchange of fresh air during standby situations. An adjustable configuration was conceived and initial samples of a comparable commercial type were fabricated and subjected to a limited performance test. Results showed this type to be highly functional, however, under fire emergency conditions several areas proved to be marginal or inadequate. To eliminate these problem areas, NCTRF modified the facepiece design. As the required task approached a resolution, the fiscal year ended and the program terminated. Because the need still exists for an improved hood, appropriation of additional funds and continuance of this redesign study is recommended. GRA

N79-25765# Navy Clothing and Textile Research Facility Natick Mass

FIELD EVALUATION OF EXPERIMENTAL CRASH-CREW FIREFIGHTER'S FACEPIECE Final Report, Oct 1976 - Sep 1977

Norman F Audet Dec 1978 47 p refs

(AD-A066544 NCTRF-135) Avail NTIS HC A03/MF A01 CSCL 06/17

The Navy Clothing and Textile Research Facility (NCTRF) under the sponsorship of the Civil and Environmental Engineering Development Office (CEEDO) Detachment 1 ADTC Tyndall Air Force Base conducted a field evaluation of an Abcrite-over-coated experimental crash-crew firefighter's gold facepiece to determine if the experimental facepiece was more durable than the standard item. Laboratory results had previously shown the experimental facepiece to have at least 10 times better abrasion resistance than the standard. Author (GRA)

N79-25766# Army Aeromedical Research Lab Fort Rucker Ala

MATHEMATICAL MODELS OF SKIN BURNS INDUCED BY SIMULATED POSTCRASH FIRES AS AIDS IN THERMAL PROTECTIVE CLOTHING DESIGN AND SELECTION Final Report

Francis S Knox III Thomas L Wachtel and Stanley C Knapp Jun 1978 32 p refs Submitted for publication

(DA Proj 3E7-62173-A-819)

(AD-A066946 USAARL-78-15)

Avail NTIS

HC A03/MF A01 CSCL 12/1

The design and selection of thermal protective clothing takes into account many factors, e.g., appearance, comfort, durability, cost, and thermal protective capability. To aid in determining the appropriate balance among these factors, thermal protective capability must be measured in a quantitative and clinically meaningful way. To provide such a valid assessment of thermal protective capability, two mathematical models were developed to predict skin burn damage based on data derived from 95 domestic white pigs exposed to simulated postcrash fires. The first model, a multidiscriminate statistical model derived from experimental data, was used to determine the importance of many variables, e.g., incident heat flux, exposure time, initial skin temperature, and color of the skin. The second, an analytical model, assumes that tissue damage proceeds as a first order

chemical reaction dependent on tissue temperature and that total damage is merely the time integral of tissue damage during heating and cooling. It also takes into account tissue water boiling and thermal shrinkage which alter burn depth in more severe burns. The predicted burn depths from measurements of thermal energy transfer through or emanating from burning fabrics when combined with burn area, age and sex yield predicted survivability. Predictions of changes in survivability allow rational judgments to be made regarding the effectiveness of implementing proposed flight suit clothing fabric and design changes. GRA

N79-25983# Mitre Corp McLean Va
IMPROVEMENTS IN THE MAN-MACHINE INTERFACE FOR DATA ACQUISITION, DISPLAY AND CONTROL c54
 Warren A Manison /in AGARD Tech for Data Handling in Tactical Systems 2 Apr 1979 14 p refs (For primary document see N79-25977 16-99)
 Avail NTIS HC A16/MF A01

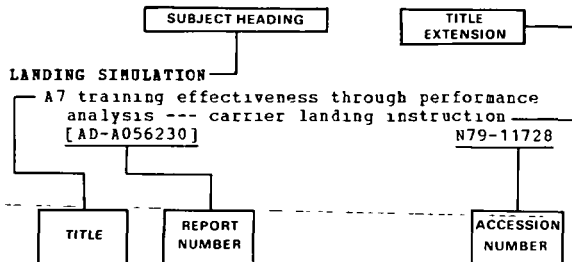
A method is discussed for improving the man-machine interface in civil and military data automation capabilities. The method combined existing hardware technology with innovative software features to provide an interactive capability responsive to the system user. Integral to the concept was the use of a touch entry device and a tabular display for message composition and entry. One or more tabular displays were used for the presentation of data forced to the position or requested by the user. Support software is discussed including the use of implied logic designed to facilitate the message entry process, branching logic to guide or prompt the user in formatting messages for entry to the system, and display logic responsive to the needs of the position. Techniques for application of this technology to a real-time system like Air Traffic Control are described. Potential application to other types of systems was identified. J A M

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SEPTEMBER 1979

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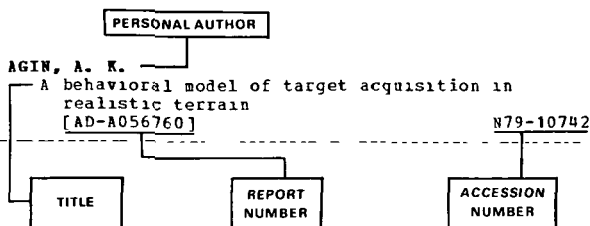
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